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ABSTRACT

The study presents the results of a survey of current (1975) and projected near-future (1975 through 1977) labor market trends for nuclear-related technicians in the 12-State Western Interstate Nuclear Region Board (WINB) area. The survey covered employers and educators/trainers of nuclear related manpower in private industry, research laboratories, governmental agencies, government contractors, educational organizations, and medical facilities. In January, 1975, over 16,800 nuclear related technicians were reported employed in the western States, with U.S. Energy Research and Development Administration (ERDA) contractors the largest single employer group, but by late 1977 private organizations and utilities are projected to employ substantially more nuclear related technicians than ERDA. A growth rate of 10% a year is projected over the next three years, three times greater than the growth rate projected for all technicians in the U.S. economy. Large manpower shortages are predicted for nuclear production and reactor operation and for tests and measurement. A very large excess of manpower is projected for nuclear medical and health related technicians. The data collected in the survey are presented in tables and discussed; the survey questionnaire, additional tables of data, and a list of WINB region training institutions are appended. (Author/AJ)

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AN ANALYSIS OF NUCLEAR RELATED TECHNICIAN MANPOWER IN WESTERN STATES

for the region served by the Western Interstate Nuclear Board

by

Larry M. Blair

Oak Ridge Associated Universities

with

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United States Energy Research and Development Administration

A Report by the

Manpower Development Division

Oak Ridge Associated Universities

to the

Manpower Information Systems Branch

Division of Labor Relations

United States Energy Research and Development Administration

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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PREFACE

This survey is the first of its kind in the twelve states served by the Western Interstate Nuclear Board. It builds on two other similar surveys covering the southern states served by the Southern Interstate Nuclear Board. These surveys are attempts to ascertain the feasibility of conducting comprehensive manpower supply and demand data collection and analysis studies in this field. The present survey appears to have been a very successful research effort, providing a solid data base on employment and training of nuclear related technicians in the western states.

The three surveys have shown that it is possible: to define and contact the universe of employers and trainers of nuclear related technicians; to develop relevant questionnaires for gathering data needed for short term labor market forecasts; to obtain a response rate to the survey that covers the vast majority of the organizations in the universe; and to develop useful labor market forecasts.

The list of organizations contacted in this survey was prepared by the staff and members of the Western Interstate Nuclear Board whose excellent preparatory work and continued cooperation provided an essential contribution to the successful conclusion of the survey. The survey research staff wishes to express their appreciation to the 2045 individuals and organizations that responded to the survey request. The questionnaires were developed, mailed, collected, tabulated and analyzed by the staff of the Division of Labor Relations, U.S. ERDA and the Manpower Development Division, Oak Ridge Associated Universities.

I. AN OVERVIEW

Survey Procedures

During early 1975, data was collected on the current and projected future levels of employment and training for nuclear related technicians in the twelve western states served by the Western Interstate Nuclear Board. Survey questionnaires were mailed to over 2600 organizations; 79 percent of these responded to the data request. All of the government-owned, contractor-operated facilities in the U.S. ERDA system located in the western states responded to the survey request as did virtually all of the major private industries, utilities, and education organizations in the nuclear related field.

Inquiries to a 20 percent sample of the non-respondents indicate that the survey accounts for approximately 95 percent of the total nuclear related technician employment in the western states. Most of the omitted data (approximately 90 percent) is in the nuclear medical and health related technician area. The evidence indicates no significant bias exists in the reported supply and demand data for the various technician categories; therefore, the labor market forecasts may be considered good indicators of general trends for the availability and utilization of nuclear related technician manpower in the western states.

Demand and Supply of Nuclear Related Technicians

As of January 1975, over 16,800 nuclear related technicians were reported employed in the western states (see table I.1). At present, U.S. ERDA contractors are the largest single employer group (approximately one-third of total); but by late 1977 private organizations and utilities are projected to employ substantially more nuclear related technicians than the U.S. ERDA contractors. By late 1977, the total level of employment is projected to reach 22,300, a growth rate of ten percent per year over the next three years. This is equal to the annual growth rate reported for nuclear related technicians in southern states from 1971 through 1973, and is three times greater than the projected growth rate for all technicians in the U.S. economy. Total additional demand (new positions plus replacement for attrition) is projected at 15 to 20 percent *per year* for the various groups of technician jobs.

TABLE I.1

OVERVIEW

ADDITIONAL DEMAND AND ADDITIONAL SUPPLY
NUCLEAR-RELATED TECHNICIANS

WINB REGION

TECHNICIAN GROUP	EMPLOYMENT JANUARY, 1975	ADDITIONAL MANPOWER DEMAND AND SUPPLY COMPARISON PER YEAR FOR 1975-1977			PROJECTED LABOR MARKET TRENDS
		ADJUSTED ADDITIONAL DEMAND		ADDITIONAL SUPPLY	
TOTAL, WINB REGION	16,802				
1. Nuclear Research, Production and Reactor Operation	2,639	15%	408	250	Shortages
2. Test and Measurement	2,864	20%	652	465	Shortages
3. Instrumentation Techniques	689	17%	132	150	Approximate Balance
4. Nuclear Medical and Health	5,471	18%	1,107	1,685	Surpluses
5. Other Nuclear-Related	5,143	16%	Comparisons not possible for this group.		

Large manpower shortages are projected for two groups of technicians: (1) nuclear production and reactor operation and (2) test and measurement. The jobs categorized in the instrumentation techniques group show approximate labor market balances for the three year period. A very large excess of manpower is projected in the group of nuclear medical and health related technicians; however, some specific jobs within this area do have projected balances or even shortages of manpower.

Table I.2 shows the employment by state. California accounts for almost 7600 employees (45 percent of the total), while Colorado, Washington, New Mexico and Idaho all have over 1000 employees.

TABLE I.2

OVERVIEW

REPORTED NUCLEAR RELATED TECHNICIAN
EMPLOYMENT BY STATE

WINB REGION, JANUARY 1975

ALASKA	69	IDAHO	1081	OREGON	781
ARIZONA	576	MONTANA	59	UTAH	269
CALIFORNIA	7571	NEVADA	889	WASHINGTON	1952
COLORADO	2127	NEW MEXICO	1147	WYOMING	222

STATE NOT REPORTED = 75

II. INTRODUCTION

Purpose and Scope

Economic activity in nuclear related areas (energy production, R&D, education, medicine and industrial applications) has grown rapidly over the last three decades. Recently, the emphasis on energy development has produced accelerated growth plans in the nuclear energy field. This increase in nuclear related activity has caused a corresponding increase in the amount of manpower occupied in the field. The labor market impact of nuclear related employers and workers has, accordingly, become more noticeable. Education and training organizations have responded to the needed manpower requirements by developing and offering nuclear oriented programs.

This study presents the results of a survey of current and projected near-future labor market trends for nuclear related technicians in the Western Interstate Nuclear Board (WINB) region. The survey reports current employment levels, January 1975, and projected additional manpower requirements and additional manpower supplies for 1975 through 1977. The WINB states are Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. The survey covered employers and educators/trainers of nuclear related manpower in private industry, research laboratories, governmental agencies, government contractors, educational organizations and medical facilities.

The list of occupations that should be classified as technician positions varies somewhat according to the individual views of employers, educators/trainers and analysts. Technician jobs, as defined by these various sources, range from higher level craft/operator positions to technical activities approaching the engineer/scientist classifications. Most positions which require a bachelor's degree would be classified as engineer or scientist jobs. For the scientist area, however, some positions which require a bachelor's degree are classified as technician jobs.

In order to provide the survey respondents with a guideline of what a nuclear related technician position might encompass, the following operational definition was included in the survey instructions: "...technicians who need a core of nuclear related knowledge in order to perform their duties. This knowledge may come from exposure on the job, through specialized training or from formal education usually equivalent to two years beyond the high school level."

In addition, a list of technician occupations and training areas, with appropriate descriptive phrases, was provided in the survey. (Appendix A contains a copy of the survey instrument.) The vast majority of the respondents used these predefined categories exclusively. It must be noted, however, that each survey respondent made his own decision as to which positions and/or training programs qualified for inclusion in the survey report. A number of employers and educators did contact the survey research team to discuss their responses. The predefined lists of nuclear related technician jobs and training areas are based on categories developed for earlier surveys with modifications, additions and deletions incorporated in the WINB questionnaire by the survey research staff.

The decision to focus on technicians in the survey was based on three considerations. One, past studies* have indicated that the trend in the nuclear field toward more applied research, demonstration projects and commercialization is causing an increase in the relative share of technicians needed in the workforce. Two, there is a lack of hard data and information concerning actual labor market trends for the technicians in nuclear related fields. Three, the Division of Labor Relations of U.S. ERDA is engaged in development work related to technical manpower.

Data Source

The original universe for the survey was developed by the Western Interstate Nuclear Board** (WINB). The original mailing list contained 3009 organizations (see table II.1). WINB's goal was to identify all *potential* employers and educators/trainers of nuclear related technician manpower in the western region. The organizations included in the mailing list were grouped into five general categories: industry, medical, educational, government (state, local and federal) and U.S. AEC contractors.

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* *Nuclear Manpower Survey*, American Nuclear Society, Hinsdale, Illinois, for the Division of Nuclear Education and Training, U.S.AEC, 1970; *Nuclear Technician Manpower Survey*, Braden and Paul, for the Southern Interstate Nuclear Board, 1971; *Nuclear Related Technician Survey for the Southern Interstate Nuclear Board Region*, Division of Labor Relations, U.S. AEC, 1973; *Technician Manpower 1966-1980*, B.L.S., U.S. Department of Labor, Bulletin 1639, U.S.G.P.O., 1970.

** *Nuclear Technician Manpower in the Western United States, Development of a Survey Population....*, WINB, Prepared for the Division of Labor Relations, U.S. AEC, Lakewood, Colorado, February 1974.

The WINB obtained its list of potential employers from five basic sources: licensees of radioactive materials (U.S. AEC or "agreement state" agencies), registrants of radioactive materials and sources (state agencies), radiological health organizations (public and private), lists from professional associations and publications relevant to the nuclear field, and lists from the U.S. AEC on federal agencies, reactor operations and government contractors.

The potential education and training organizations for nuclear related technicians were identified by WINB from four general sources: lists of colleges and universities (state and federal agencies, and educational associations), lists of vocational schools (state agencies), list of hospitals and medical units (state agencies and medical societies) and from "on-the-job" training sources (U.S. AEC questionnaire).

TABLE II.1

SURVEY UNIVERSE AND RESPONSE

WINB REGION

		3009	Potential Universe supplied by WINB
		+13	Universe added by Research staff
	=	3022	Original Total Potential Universe
		-58	Pulled as Not Appropriate for Universe (veterinarians, dentists, small local government civil defense, etc.)
	=	2964	
		-371	Duplicates
100%	=	2593	Unique Universe
79%		-2045	Returned questionnaires
40%			1025 reporting nuclear-related technicians
39%			1020 reporting no nuclear-related technicians
21%	=	548	Non-respondents, including 30 bad mailing addresses

This systematic, thorough search and identification methodology used by the WINB staff resulted in a very comprehensive mailing list. The survey research staff uncovered only 13 additional organizations (through contacts during the survey) to add to the mailing list, to give a total potential universe of 3022. A review of this universe eliminated 429 organizations that were either inappropriate for the survey (58 veterinarians, dentists, small local government civil defense officers, etc.) or duplicate contacts with the same organization. The unique universe for the survey, therefore, consisted of 2593 organizations.

The survey forms were mailed in January 1975. A second request was sent to organizations that had not responded as of February 28, 1975 (approximately 50% of the universe). Finally, follow-up telephone calls were made to 80 non-respondent organizations that appeared to be potentially large employers and/or sources of training for nuclear related technicians.

A total of 2045 questionnaires were returned (79% of the unique universe). This included responses from all of the U.S. AEC, now U.S. ERLA, contractors in the western states. Of the 2045 responses, 1025 reported employment and/or education/training programs for nuclear related technicians. Questionnaires were not returned by 548 organizations (21% of the unique universe). Thirty of the 548 non-responses resulted from improper or inadequate mailing addresses that were not correctable.

Data Omissions and Bias

A special sample survey was conducted to determine the probable size of the omitted employment data and to establish any bias among the non-respondent firms (see table II.2). Data for this sample survey was collected by telephone and included 110 of the 548 non-respondents (i.e., a 20% sample). The number of organizations chosen from each employer category for this omission and bias sample was weighted according to the relative response rate of that category in the survey. Most of the organizations selected were, therefore, in the industry and medical groups.

The content of the omission and bias sample survey was limited to requests for the total number, if any, of nuclear related technicians employed by the organization. Information was collected from 97 of the 110 firms. The vast majority of non-reported (i.e., omitted) employment data appeared in the medical area (162 of 180 positions)--these were, for the most part, hospitals that had not responded. Omissions in other categories were minimal to non-existent.

TABLE II.2

BIAS AND OMISSION STUDY FOR EMPLOYMENT SURVEY

WINB REGION

TYPE OF ORGANIZATION	NON RESPONDENTS #	NON RESPONDENTS %	NUMBER CONTACTED**	NUMBER OF NUCLEAR RELATED TECHNICIANS	ESTIMATED OMISSION OF NUCLEAR RELATED TECHNICIANS
ERDA Contractors	0	0%	0	0	0
Education	38	20%	7	1	5
Government	37	12%	7	0	0
Industry	248	24%	40	17	85
Medical	225	21%	43	162	810
TOTALS	548		97	180	900
+ Additional nuclear-related technicians for organizations possibly missed in the survey universe*					100
Total Omission Estimate (or slightly less than 6% of reported employment)					1000

* These may be assumed to be distributed approximately 90 in medical and 10 in all others.

** 110 firms (20% of the non-respondents) were selected for the omission study, 13 of these either could not be reached (telephone disconnected, no answer, or appropriate person gone) or did not give out information on employment.

The employment data collected in the omission sample survey was enlarged to represent the total number of nuclear related technician positions for non-respondents. Also, some further omissions were allowed for organizations possibly missed in the survey. These adjustments provide a total omission estimate of about 6% of the reported employment (see table II.2). Thus, the employment survey is estimated to cover about 95% of the total universe with most of the omissions (90%) occurring in the medical areas and the remainder (10%) occurring mainly in the industry category. The higher percentage of reported employment than survey organization response (95% to 79%) was to be expected since a special effort was made to obtain responses from all major employers.

Omitted data on new supply is harder to estimate. Technician training is scattered in informal and formal programs throughout industry, laboratories, government agencies and medical units, as well as in formal education organizations. Hospitals, where the largest data omission occurred, often provide technician training, so the omitted additional demand and additional supply data can be expected to balance out for medical organizations. The data omission for industry was very small. Most of the large industrial employers were contacted in the special telephone follow-up requests for data so the amount of omitted training in this area would be negligible. With respect to formal education organizations, completed questionnaires were received from 38 of 42 schools offering a nuclear related program* in the western states. The non-reported programs are all in the health related field. Three of these schools are in southern California and the fourth is in Colorado.

Based on these estimates of data omissions and biases, the survey results provide an excellent data base for use in comparing the demand for and supply of nuclear related technicians in the western states. The only significant omissions appear to be in the medical areas where omitted supply and demand data may be expected to approximately balance out so no significant bias should be present in the reported survey data.

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* *Technician Education Yearbook, 1971-1972.*

III. DEMAND DATA IN THE SURVEY

Employment Levels

Total reported employment of nuclear related technicians in the western states was 16,802 for January 1975. Table III.1 presents the data on employment and projected additional manpower requirements by individual job titles. The job titles are grouped into five job clusters: reactor operation and production, test and measurement, instrumentation, medical and health related, and craft and other related. For the five job clusters, the nuclear medical and health related group had the highest reported employment, 5471 or 32.5 percent of the total, and nuclear instrumentation had the lowest, 689 or only 4 percent of the total.

Reported employment in three job titles, radiologic technologist, electronic and structural technician, and soils evaluation technician, each exceeded 1000. Twelve other job categories had reported employment of over 500. Only 61 of the 16,802 jobs (1/3 of 1 percent) had to be classified in one of the miscellaneous categories (i.e., job codes 100, 200, 400, and 500). Also, two additional job titles reported by employers were included in the report; these are tritium handler and sodium facility technician.

One caution concerning these employment counts should be noted. In some cases, workers are occupied in the nuclear related job activities during only a part of their working time. Some employers reported these part-time work activities in full-time equivalent numbers, while other employers reported the total headcount of all individuals involved in the job category. This use of total headcount for part-time nuclear related work activity appeared to be particularly prevalent for the soils evaluation technician category. In the other cases involving part-time nuclear related work, the respondents normally reported in full-time equivalent numbers (e.g., for the nuclear medical and health related positions and for nuclear research, test and production positions).

Appearing below the grand total line in Table III.1 is an "Estimated True Totals" line. This includes the estimates for omitted or non-reported employment of nuclear related technicians as discussed in section II. As pointed out before, approximately 1000 jobs were estimated as being omitted from the survey; thus the estimated true total employment of nuclear related technicians in the western states is placed at 17,800. Ninety percent (or approximately 900) of the non-reported positions were estimated to be in the

TABLE III.1

REPORTED NUCLEAR RELATED TECHNICIAN

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS BY OCCUPATION

WINB REGION

JOB CODE*	OCCUPATION	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	184	22	7	28	7	23	9
102	Accelerator Operator	143	9	15	11	15	15	29
103	Radioisotope-Production Operator	79	17	18	16	12	18	18
104	Nuclear Power Plant Operator	196	9	16	9	100	16	39
105	Nuclear Material Processor, Senior	121	10	6	10	5	11	8
106	Hot-Cell Technician	177	11	9	13	9	16	11
107	Nuclear Facility Equipment Operator	519	49	68	50	35	54	36
108	Nuclear Facility Maintenance Technician	550	29	65	33	21	34	15
109	Plutonium Handling Technician	636	46	17	51	19	44	22
110	Tritium Handler	2	0	0	0	1	0	1
111	Sodium Facility Technician	25	2	4	1	0	1	0
100	Other Nuclear Test and Production Technician	7	2	2	3	0	3	0
	Totals for Reactor Operation and Production Technicians	2639	206	227	225	224	235	188
	Percentage Rates **		8%	9%	8%	8%	8%	6%
201	Radiation Control Technician	799	64	64	76	81	82	93
202	Nuclear Facility Chemistry (Radiochemistry) Technician	517	70	82	80	73	100	116
203	Non-Destructive Testing Technician	784	95	155	103	152	108	101
204	Radiographer	679	65	95	70	78	77	74
205	Nuclear Geological Technician	67	15	21	10	20	10	17
200	Other Test and Measurement Technician	18	0	2	0	1	0	0
	Totals for Test and Measurement Technicians	2864	309	419	339	405	377	401
	Percentage Rates		11%	15%	10%	12%	10%	11%
301	Instrumentation and Control Technician	373	29	31	37	42	33	50
302	Well-Logging Technician	221	21	35	25	29	25	27
303	X-Ray Calibration Technician	95	4	10	2	7	6	7
	Totals for Nuclear Instrumentation Technicians	689	54	76	65	78	64	84
	Percentage Rates		8%	11%	8%	10%	8%	10%

*These job codes were developed for use in the survey report and in the questionaires.

**These figures represent the projected additional manpower needs for each year as a percent of the projected employment level for the beginning (January) of each year.

TABLE III.1 (Con't.)

REPORTED NUCLEAR RELATED TECHNICIAN

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS BY OCCUPATION

WINB REGION

JOB CODE	OCCUPATION	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
401	Radiologic Technologist	3421	414	304	426	382	457	321
403	Nuclear Medical Technologist	884	108	152	146	201	155	202
405	Urology X-Ray Technician	76	6	4	9	10	7	10
406	Orthopedic Radiologic Technician	69	5	7	10	17	7	15
407	Special Procedures Technician	296	41	44	50	65	51	62
408	Radiation Therapy Technician	265	28	35	46	42	40	47
409	Internal Dosimetry Technician	45	6	5	4	8	9	10
410	Radiobiology Technician	339	48	5	37	7	45	17
411	Radiopharmacist	17	2	12	2	13	4	14
412	Inhalation Toxicology Technician	57	5	16	8	14	11	13
400	Other Medical-Related (Nuclear) Technician	2	0	0	0	0	0	0
	Totals for Nuclear Medical and Health Related Technicians	5471	663	584	738	759	786	712
	Percentage Rates		12%	11%	12%	13%	12%	10%
501	Soils Evaluation Technician	1069	109	84	150	80	147	63
502	Draftsman	411	51	56	51	68	48	53
503	Data Processing or Computer Programming Technician	227	19	19	22	26	24	29
504	Mechanical and Structural Technician	518	32	26	38	60	40	71
505	Welding Technician	353	36	29	28	63	36	87
506	Electronic and Instrument Technician	1743	118	84	124	144	127	200
507	Quality Control and/or Quality Assurance Specialist	418	42	50	35	68	39	81
508	Metallurgical Technician	212	10	22	8	25	8	16
509	Ceramic Technician	63	4	8	6	8	5	8
510	Ventilation Technician	95	11	5	7	8	6	5
500	Other Craft-Related (Nuclear) Technician	34	0	1	1	1	1	1
	Totals for Craft and Other Nuclear-Related Technicians	5143	432	384	470	551	481	614
	Percentage Rates		8%	7%	9%	10%	8%	10%
Grand Total*------Reported Nuclear Related Technicians		16,802	1664	1688	1837	2017	1945	1996
	Percentage Rates		10%	10%	10%	11%	9%	10%
Estimated True Totals**		17,800	1760	1790	1940	2130	2060	2110

*Sums for the individual occupations may not add to the same total as shown in the GRAND TOTAL for the [illegible] region due to rounding off of employment and additional manpower figures within each occupation.

**See the explanation in Section II of this report.

nuclear medical and health related group, leaving only about 100 positions to be scattered among the other four job clusters (an increase of less than 1 percent in these areas).

Projected Additional Manpower Requirements

Job openings for all nuclear related technicians in the western states are projected, by the responding organizations, to be approximately 20 percent of the employment levels for 1975, 1976, and 1977 (see table III.1). The additional manpower needed to fill these job openings is projected to be divided about equally between manpower for replacement purposes and manpower for new positions for all three years.

The replacement positions are the summation of job vacancies in individual firms created by various types of attrition, e.g., deaths, retirements, transfers, upgradings, resignations, terminations. The number of new positions is based on the expansion of activity and manpower needs as projected by the organizations in the survey.

The survey universe included all existing organizations that might potentially have job openings for nuclear related technicians during the 1975 through 1977 time period, regardless of the organizations' employment or non-employment of nuclear related technicians in 1974. It was impossible, however, to estimate any new job openings for nuclear related technicians that might occur because of the establishment of new firms in the western states during 1975 through 1977. In all likelihood, the number of new positions created by any new firms would be relatively small over the three-year projection period and would not, therefore, significantly affect the additional manpower needs estimates.

Two other aspects related to the survey's manpower needs projections also deserve special mention. First, very small employers often expressed problems in estimating any attrition or labor turnover and simply ignored the projections; these small deletions would not bias the basic projections. Second, several employers, large and small, indicated an inability to forecast manpower needs for 1977; this omission does require the 1977 projections to be treated with a little more caution because they may contain a small downward bias.

Total additional manpower needs projections for the five job clusters vary somewhat from a low range of 14-17 percent for the three years for the reactor operation and production cluster to a high range of 21-26 percent

for the test and measurement, and nuclear medical and health related groups.

For replacement needs, three groups (reactor operation and production, nuclear instrumentation, and craft and other nuclear related) recorded low estimates of 8 percent per year. Nuclear medical and health related has the high estimate for replacement rates of 12 percent per year.

The various projections of manpower needed to fill new positions show a sizeable divergence among the job clusters. Reactor operations and production, and craft and other nuclear related groups are the lowest, with estimates as small as 6 and 7 percent per year, respectively. Test and measurement and nuclear medical and health related groups are the highest, with estimates as large as 15 percent and 13 percent per year, respectively.

The individual technician job titles with the very large reported employment levels naturally tend to have the highest absolute levels of additional manpower needs (see for instance, job codes 107, 201 through 204, 401, 403, 501, 504, and 506 in table III.1). Several technician job titles should be noted that have particularly high projected growth rates for new positions (over 50 percent through 1977); these include nuclear power plant operators, radiochemistry, non-destructive testing, nuclear medical technology, medical special procedures, and welding technicians. In addition, several job titles which currently have quite small employment totals also have a very high projected growth rate in the near future; these include radioisotope-production, nuclear geology, orthopedic radiology, internal dosimetry, radiopharmacy and inhalation toxicology.

Conversely, several technician job titles had relatively low projected rates of additional manpower needs for new positions or for replacement. Areas with relatively low projected growth of new positions in the near future (less than 20 percent through 1977) include nuclear facility maintenance, plutonium handling, and ventilation technology. Job titles with low projections for attrition or job turnover rates are nuclear power plant operator (which has very high growth rates for new positions), nuclear facility maintenance (which has low growth rates for new positions), x-ray calibration and metallurgy.

Demand Data by State

California has, by far, the most nuclear related technicians in the western states, with 45 percent of the employment and 48 percent of the additional manpower needs (see table III.2). Colorado and Washington are a

TABLE III.2

TOTAL REPORTED NUCLEAR RELATED TECHNICIAN

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS

WINB REGION AND EACH STATE

	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975		1976		1977	
		REPL.	NEW	REPL.	NEW	REPL.	NEW
Western Interstate Nuclear Board Region*	16,802	1664	1688	1837	2017	1945	1996
Percentage Growth Rate**		10%	10%	10%	11%	9%	10%
Alaska	68	27	13	31	9	13	4
Arizona	576	65	60	76	82	75	85
California	7566	755	849	831	1057	902	1011
Colorado	2124	195	108	230	148	232	151
Idaho	1080	73	79	71	67	73	57
Montana	59	18	6	11	16	19	11
Nevada	889	70	22	75	81	80	154
New Mexico	1146	124	162	122	149	126	163
Oregon	779	84	60	93	72	103	70
Utah	269	21	54	33	48	33	48
Washington	1950	211	253	243	271	263	222
Wyoming	221	22	20	22	15	26	21
State Not Reported	75	0	3	2	2	1	1

*Sums for the individual states may not add to the same total as shown for the region due to rounding of employment and manpower figures within each state.

**These figures represent the projected additional manpower needs for each year as a percent of the projected employment level for the beginning (January) of each year.

rather distant second and third in the employment of nuclear related technicians. Sparsely populated states with relatively high levels of employment are New Mexico, Idaho and Nevada.

Nuclear medical and health related technician employment tends to be concentrated in high population states where major medical facilities have developed, e.g., California, Washington, Arizona and Colorado. Much of the employment in the other four technician clusters or groups is concentrated around the government-owned, contractor operated facilities (direct employment in the contractor facilities plus employment in related organizations, e.g., suppliers and "spin off" industries). These government-owned, contractor operated facilities are located in California (especially the northern part), Washington, Colorado, Idaho, New Mexico and Nevada. The mineral and mining states do not contribute significantly to the employment figures, since relatively few technicians (e.g., well-logging, geological and ventilation technicians) are required in exploration, drilling, mining, milling and concentration activities. Appendix B contains detailed data by job category for each state.

Demand Data by Type of Employer

Government contractors account for the largest amount of current employment of nuclear related technicians in the western states, with 5658 employees or 34 percent of the total (see table III.3). Medical organizations and private industry are, also, large employers of nuclear related technicians with 4809 employees or 29 percent and 4685 employees or 28 percent, respectively. Employment in government (civilian plus military) and in educational organizations (largely, public institutions) accounts for less than 10 percent of the total.

The additional manpower needs are shown as percents of the totals for each year in table III.3 in order to demonstrate the relative rates of manpower required for replacement and new positions among the different types of employers. A comparison of the percentage of replacement needs to the percentage of current employment shows that medical organizations have relatively high projected replacement manpower requirements as do educational organizations for 1976 and 1977, and that government contractors have relatively low replacement needs.

The percentage of manpower needed to fill new positions provides information concerning which employer groups are projecting the greatest growth

TABLE III.3

REPORTED EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS

BY TYPE OF EMPLOYER - PERCENTAGES

WINB REGION

EMPLOYER	EMPLOYMENT JANUARY 1, 1975		ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
	%	#						
Government Contractor*	34	5658	26%	24%	25%	19%	26%	24%
Government Civilian, Federal, State & Local	6	984	6	5	7	3	7	3
Military	1	73	1	1	1	0	1	0
Hospital and Medical	29	4809	35	31	36	34	35	31
Educational (Non-Medical)	3	593	2	2	5	2	4	2
Private Industry	27	4685	30	37	26	42	27	40
	100%	16802	100%	100%	100%	100%	100%	100%

*These are primarily the government owned, contractor operated facilities (GOCOs).

in the near future. The employment of nuclear related technicians in private industry is projected to expand rapidly in comparison to government contractors -- 37 to 40 percent each year versus 19 to 24 percent. According to these projections, employment of nuclear related technicians in private industry will be substantially larger than employment in government contractors by late 1977 -- 12,760 employees versus 10,350 employees. The percentage of employment located in medical organizations is projected to expand somewhat, while the percentage of employment accounted for in civilian government, the military and educational organizations is expected to decline.

IV. SUPPLY DATA IN THE SURVEY

Training for New Nuclear Related Technicians

Each year additions to the supply* of nuclear related technicians occur as individuals complete various types of education and training programs. Table IV.1 presents projections of these new technicians, i.e., the expected number of graduates or completers from training programs, for 1975 through 1977. Data on enrollments and program capacities were not requested in the survey. The various types of training programs have been grouped in five clusters that correspond to the training required for the five job clusters developed in the demand section.

The training programs are listed as either institutional or employer oriented**. Institutional programs refer to formal educational and training activities set up, at least partially, to supply the manpower needs of other employers. The vast majority of the institutional programs are located in formal education organizations, e.g., vocational-technical schools, junior colleges, community colleges, four-year colleges, universities, medical schools and hospitals. A few private employers and government facility contractors, however, reported formal programs that explicitly train individuals to meet manpower needs outside of that organization and these programs are listed in the institutional category.

Employer training programs refer to those in-house programs established to train just the employees of that organization. These programs are concentrated in private organizations, government contractors, and government units but, also, are found in medical and educational organizations. The programs reported here are either formal in-house training activities or formal on-the-job training; skills gained solely through work experience are not included.

The total projected number of newly trained technicians ranges from approximately 2550 in 1975 to 2800 in 1977, for the western states, *excluding* technician training in the craft and other nuclear related cluster. The projections show a sizeable nine percent growth in total new supply between

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* The word *supply* is being used in a very broad context. The newly trained persons are not part of the strictly defined, effective supply until they actually seek work in nuclear related positions and complete any further training needed to make them job ready.

** The surveys were reviewed by the survey research staff and any ambiguities resolved. This included eliminating any double reporting of the same program.

TABLE IV.1

NEW NUCLEAR RELATED TECHNICIAN SUPPLY BY TRAINING AREAS

PROJECTED GRADUATES AND COMPLETIONS FROM
INSTITUTIONAL AND EMPLOYER TRAINING PROGRAMS**
WINB REGION

TRAINING OR JOB CODE*	TRAINING AREA	INSTITUTIONAL OR EMPLOYER**	PROJECTED NEW NUCLEAR-RELATED TECHNICIANS 1975	1976	1977
	Operation and Maintenance of Nuclear Facility				
17.2001	Installation, Operation, and Maintenance of Reactors	INSTI.	4	0	0
16.0115	Nuclear Technology	INSTI.	53	48	48
17.2004	Industrial Uses of Radioisotopes	INSTI.	28	25	29
10	Nuclear Research and Production Technology	INSTI.	50	50	50
10	Reactor Operator	INSTI.	3	3	3
101	Reactor Operator	EMPL.	16	13	13
102	Accelerator Operator	EMPL.	6	11	13
104	Nuclear Power Plant Operator	EMPL.	5	72	19
105	Nuclear Material Processor, Senior	EMPL.	2	4	5
106	Hot-Cell Technician	EMPL.	0	4	3
107	Nuclear Facility Equipment Operator	EMPL.	3	3	2
108	Nuclear Facility Maintenance	INSTI.	45	55	65
	SUBTOTALS		215	292	250
	Yearly Percentage Rates of Change			+36%	-14%
	Test and Measurement Technology				
07.0902	Radiological Health (Health Physics)	INSTI.	64	81	81
16.0105	Chemical Technology (Nuclear Option)	INSTI.	8	13	13
202	Nuclear Facility Chemistry (Radiochemistry)	EMPL.	6	11	18
17.2002	NDT Technology	INSTI.	321	341	341
203	NDT Technology	EMPL.	89	97	59
17.2003	Radiography	INSTI.	6	6	6
204	Radiography	EMPL.	87	54	39
201	Radiation Control	EMPL.	42	30	29
205	Nuclear Geological Technology	EMPL.	5	4	4
	SUBTOTALS		628	637	590
	Yearly Percentage Rates of Change			+ 1%	- 7%
	Instrumentation Technology				
16.0108	Electronic Technology (Nuclear Option)	INSTI.	65	76	88
16.0109	Electromechanical Technology (Nuclear Option)	INSTI.	20	20	20
16.0112	Instrumentation Technology (Nuclear Option)	INSTI.	22	22	22
301	Instrumentation and Control Technology	EMPL.	3	11	20
302	Well-Logging Technology	EMPL.	24	21	23
	SUBTOTALS		134	150	173
	Yearly Percentage Rates of Change			+12%	+15%

*The job codes (three digit numbers) are codes developed for use in the employment survey and refer to training related to that particular occupation. The training area codes (six digit numbers) refer to training areas as defined and numbered in vocational-technical education activities.

**See the discussion in the supply section of this report for definitions of "institutional" and "employer" training programs.

TABLE IV.1 (Con't.)

NEW NUCLEAR RELATED TECHNICIAN SUPPLY BY TRAINING AREAS

PROJECTED GRADUATES AND COMPLETIONS FROM
INSTITUTIONAL AND EMPLOYER TRAINING PROGRAMS**
WINB REGION

TRAINING OR JOB CODE*	TRAINING AREA	INSTITUTIONAL OR EMPLOYER**	PROJECTED NEW NUCLEAR-RELATED TECHNICIANS 1975	1976	1977
	Medical or Health Related Nuclear Technology				
07.0501	Radiologic Technology	INSTI.	1209	1230	1303
16.0304	Radiologic Technology (X-Ray)	INSTI.	45	65	70
401	Radiologic Technology	INSTI	10	4	7
401	Radiologic Technology	EMPL.	35	47	43
07.0503	Nuclear Medical Technology	INSTI.	166	190	206
403	Nuclear Medical Technology	EMPL.	45	48	43
407	Special Procedures Technology	INSTI.	1	2	2
07.0502	Radiation Therapy	INSTI.	58	70	76
408	Radiation Therapy	EMPL.	4	6	6
409	Internal Dosimetry Technology	EMPL.	2	4	5
410	Radiobiology Technology	INSTI.	0	3	1
410	Radiobiology Technology	EMPL.	0	1	2
411	Radiopharmacist	INSTI	3	4	4
411	Radiopharmacist	EMPL.	3	3	3
412	Inhalation Toxicology Technology	INSTI.	0	15	20
	SUBTOTALS		1571	1692	1799
	Yearly Percentage Rates of Change			+ 8%	+ 6%
	TOTALS Excluding "Craft and Other Nuclear Related Technology"		2548	2771	2812
	Yearly Percentage Rates of Change			+ 9%	+ 1%
	Craft and Other Nuclear Related Technology				
501	Soils Evaluation Technology (Nuclear-Related)	EMPL.	65	50	42
502	Draftsman (Nuclear-Related)	INSTI.	20	20	20
502	Draftsman (Nuclear-Related)	EMPL.	0	8	0
503	Data Processing or Computer Programming(Nuclear-Related)	EMPL.	3	0	0
504	Mechanical and Structural Technology(Nuclear-Related)	EMPL.	0	2	2
505	Welding Technology (Nuclear-Related)	INSTI.	152	155	160
505	Welding Technology (Nuclear-Related)	EMPL.	10	10	10
506	Electronic and Instrument Technology (Nuclear-Related)	INSTI.	25	25	25
506	Electronic and Instrument Technology (Nuclear-Related)	EMPL.	5	2	7
507	Quality Control/Assurance Technology (Nuclear-Related)	EMPL.	28	21	12
508	Metallurgical Technology (Nuclear (Nuclear-Related)	INSTI.	1	4	8
510	Ventilation Technology (Nuclear-Related)	EMPL.	5	4	0
500	Other Craft Related Technology (Nuclear-Related)	EMPL.	1	0	0

1975 and 1976, followed by just a one-percent increase between 1976 and 1977. Part of this lower growth rate for 1977 may result from an inability, especially by employers, to project activities as far as two years in advance.

The group of craft and other nuclear related training programs is excluded, since the count of "new technician supply" for this cluster is less reliable. Many more individuals in the craft and other nuclear related groups receive their nuclear related training through regular work experience after formal training in their basic technician field has been completed. Moreover, several employers indicated that union apprenticeship type programs were the training source for some of the technician occupations listed in this craft related group. These apprenticeships were not, however, reported as part of the sources of new supply.

Wide differences in the number of new technicians trained and in the growth rates for new supply are found among the different training clusters and for different years in the same cluster. By far the largest number of new technicians appears in the nuclear medical and health related group--well over half of the total for each year--with test and measurement a distant second. Also, as discussed in section II, the largest omission of new supply data is in the medical and health related group because ninety percent of the non-respondents to the survey were medical facilities and because four schools known to have health related programs did not repond to the survey.

Instrumentation technology has the highest combined rates of growth (12 percent and 15 percent), for newly trained technician supply for 1975-76 and 1976-77. Operation and maintenance of nuclear facilities has the highest single year growth rate of 36% for 1975-76; however, the change for 1977 is projected to be a minus fourteen (-14) percent. These fluctuations are due to the large number of completions of employer based programs for nuclear power plant operators being confined to just one year, 1976. Test and measurement also shows fewer new technicians in 1977 than in 1976 because of lower projections for employer based training programs.

Appendix D lists, by program area, educational and medical related organizations offering nuclear related training in the western states.

Technical Training Sources

Training of nuclear related technicians in all five clusters is located

in various types of organizations for both institutional and employer oriented programs (see table IV.2). Programs listed in the institutional category (i.e., training to meet the manpower needs of other employers) account for over 80 percent of the projected total number of new nuclear related technicians to be trained for 1975 through 1977. The percent of formal training of new technicians attributed to institutional programs in each of the five clusters ranges from 65 percent for test and measurement technology up to 94 percent for medical or health related nuclear technology. In total, for the non-medical areas, employer based programs provide about 33 percent of the nuclear related technician training. This is quite similar to the results of an earlier study by the Bureau of Labor Statistics* of sources of formal training for all new entrant technicians (non-medical) which showed employers providing 30 percent of the training.

Educational organizations and medical education facilities provide for 80 percent of the institutional training with the military contributing a significant twelve percent. Private organizations and utilities provide almost three-fifths of the total employer based training with medical facilities and government-owned, contractor-operated facilities each providing one-sixth of the total.

Within the five job clusters the percentage of institutional and employer based training programs varies considerably by different types of organizations. For medical or health nuclear related technology, medical facilities, as would be expected, provide the great majority of the training; however, educational organizations (often in cooperation with medical facilities) provide one-third of the training for this area. Educational organizations provide the majority of training in institutional based programs in three clusters: instrumentation technology, operation and maintenance of nuclear facilities, and craft and other nuclear related technology.

Private organizations and utilities provide a large amount of training in the areas of operation and maintenance of nuclear facilities, test and measurement technology, and, to a lesser extent, in instrumentation technology and craft and other nuclear related technology. Most of the training in government-owned, contractor-operated facilities is in two areas: operation

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* *Technician Manpower 1966-80*, B.L.S., U.S. Department of Labor, Bulletin 1639, U.S.G.P.O., 1970.

TABLE IV.2

NEW NUCLEAR RELATED TECHNICIAN SUPPLY BY TRAINING SOURCE

PROJECTED GRADUATES AND COMPLETIONS FROM
INSTITUTIONAL AND EMPLOYER TRAINING PROGRAMS
WINB REGION 1975-77

TRAINING SOURCE	INSTITUTIONAL # PROGRAMS	INSTITUTIONAL # GRADUATES	INSTITUTIONAL % GRADUATES	EMPLOYER # PROGRAMS	EMPLOYER # COMPLETERS	EMPLOYER % COMPLETERS
Operation and Maintenance of Nuclear Facility						
Education Organizations (Non-Medical)	13	315	57%	3	10	4%
Hospitals and Medical Schools	2	2	0.3%	0	0	-
Government, Federal, State and Local	0	0	-	1	15	6%
Military	0	0	-	0	0	-
Government Owned, Contractor Operated (GOCOS)	0	0	-	6	131	54%
Industry, Utilities and Other Private Organizations	5	236	43%	5	87	36%
TOTALS	20	553	100%	15	243	100%
Average Per Program		28			16	
Test and Measurement Technology						
Education Organizations (Non-Medical)	8	170	16%	1	1	0.2%
Hospitals and Medical Schools	1	3	0.3%	1	3	0.5%
Government, Federal, State and Local	0	0	-	3	4	0.7%
Military	3	555	53%	0	0	-
Government Owned, Contractor Operated (GOCOS)	1	85	8%	11	59	10%
Industry, Utilities and Other Private Organizations	6	226	22%	70	498	88%
TOTALS	19	1039	100%	86	565	100%
Average Per Program		55			7	
Instrumentation Technology						
Education Organizations (Non-Medical)	9	255	100%	0	0	-
Hospitals and Medical Schools	0	0	-	0	0	-
Government, Federal, State and Local	0	0	-	1	5	5%
Military	0	0	-	0	0	-
Government Owned, Contractor Operated (GOCOS)	0	0	-	2	15	15%
Industry, Utilities and Other Private Organizations	0	0	-	18	82	80%
TOTALS	9	255	100%	21	102	100%
Average Per Program		28			5	

TABLE IV.2 (Con't.)

NEW NUCLEAR RELATED TECHNICIAN SUPPLY BY TRAINING SOURCE

PROJECTED GRADUATES AND COMPLETIONS FROM
INSTITUTIONAL AND EMPLOYER TRAINING PROGRAMS
WINB REGION 1975-77

TRAINING SOURCE	INSTITUTIONAL			EMPLOYER		
	# PROGRAMS	# GRADUATES	% GRADUATES	# PROGRAMS	# COMPLETERS	% COMPLETERS
Medical or Health Related Nuclear Technology						
Education Organization (Non-Medical)	29	1552	33%	0	0	-
Hospitals and Medical Schools	196	3141	66%	45	248	83%
Government, Federal, State and Local	1	13	0.3%	0	0	-
Military	2	21	0.4%	0	0	-
Government Owned, Contractor Operated (GOCOS)	1	35	0.7%	1	7	2%
Industry, Utilities and Other Private Organizations	0	0	-	10	45	15%
TOTALS	229	4762	100%	56	300	100%
Average Per Program		21			5	
Craft and Other Nuclear-Related Technology						
Education Organizations (Non-Medical)	7	316	51%	0	0	-
Hospitals and Medical Schools	0	0	-	0	0	-
Government, Federal, State and Local	0	0	-	11	104	36%
Military	1	300	49%	0	0	-
Government Owned, Contractor Operated (GOCOS)	0	0	-	3	21	7%
Industry, Utilities and Other Private Organizations	0	0	-	20	162	57%
TOTALS	8	616	100%	34	287	100%
Average Per Program		77			8	
Totals for All Training Areas						
Education Organizations (Non-Medical)	66	2608	36%	4	11	1%
Hospitals and Medical Schools	199	3146	44%	46	251	17%
Government, Federal, State and Local	1	13	0.2%	16	128	8%
Military	6	876	12%	0	0	-
Government Owned, Contractor Operated (GOCOS)	2	120	2%	23	233	16%
Industry, Utilities and Other Private Organizations	11	462	6%	123	874	58%
TOTALS	285	7225	100%	212	1497	100%
Average Per Programs		25			7	

and maintenance of nuclear facilities, and test and measurement technology.

The military provides a substantial amount of training in the test and measurement, and craft and other nuclear related areas. Most of the training of new technicians by civilian government agencies is confined to the soils evaluation techniques training found in the craft and other nuclear related cluster.

Training Program Time Requirements

Table IV.3 provides information on the length of time required in institutional and employer based training programs. Seventy-two percent of the institutional programs are approximately one to two years in length. Several institutional programs (17 percent) are reported as more than two years in length. Nuclear medical and radiologic technologists programs often span four years, as do some nuclear technology programs.

Employer programs are much more likely to have a short duration--70 percent reported three months or less. This relatively shorter average time spent in employer programs is to be expected, since firms attempt to minimize costs by providing the training in short phases as needed by the workers for the specific jobs involved. Also, the employer programs may involve more hours per day and provide the trainee with a more concentrated learning experience. In addition, persons in employer based training programs may possess a higher level of experience and require less training.

Tests and measurement related training areas, and soils evaluation techniques make up the majority of the short term programs offered by employers. Programs of longer duration offered by employers are concentrated in the areas of in-house medical training, nuclear technology (including power plant operators) and welding to nuclear specifications.

Refresher and Job Enhancement Training Activities

In addition to employer training programs to develop new nuclear related technicians, the survey respondents also reported a great many refresher and job enhancement technician training activities (see table IV.4). These training programs are established to provide *existing* nuclear related technicians with knowledge of new or updated procedures, to broaden their range of skills and expertise, or to review knowledge of existing techniques. The survey did not specifically request information on these types of programs; thus table IV.4

TABLE IV.3

TIME REQUIREMENTS FOR TECHNICIAN TRAINING PROGRAMS
(PROGRAMS TRAINING NEW TECHNICIANS)

LENGTH OF PROGRAM	NUMBER OF INSTITUTIONAL PROGRAMS		NUMBER OF EMPLOYER PROGRAMS		EXAMPLES OF TRAINING AREAS
One to three months	15	(5%)	129	(70%)	NDT, Radiography, Radiation Control, Soils Evaluation, Well Logging, Nuclear Geology.
Approximately 1/2 year (4-7) months)	17	(6%)	18	(10%)	Nuclear Technology, Radiation Control, Radiology, NDT.
Approximately 1 year (9-15 months)	79	(29%)	22	(12%)	Radiology, Nuclear Medicine, Radiation Therapy, Radiation Control, Radiography.
Approximately 1 1/2 years (16-21 months)	11	(4%)	3	(2%)	Radiology, Nuclear Technology, Radiochemistry.
Approximately 2 years (22-27 months)	109	(39%)	10	(5%)	Radiology, Nuclear Medicine, Radiation Therapy, Nuclear Technology, Welding Technology.
Over 2 years (28-48 months)	46	(17%)	2	(1%)	Radiology, Nuclear Medicine, Nuclear Technology, Instrumentation.
	277		184		

is not meant to provide a total report, but rather to be representative of the types of refresher and job enhancement activities in existence for nuclear related technicians.

These programs are normally of relatively short duration, usually involving less than one month. The most common length of time reported was one to three days. The only programs reported lasting more than two months were for nuclear power plant operators, nuclear facility technology and radiography.

The number of individuals involved in refresher and job enhancement programs ranges from 1900 in 1975 down to 1500 in 1976 and 1700 in 1977; however, it must be noted, again, that several employers were not able to project these short term training activities further ahead than for the immediate year. Programs related to test and measurement techniques accounted for approximately one-half, and reactor and nuclear facility technology for an additional one-fourth to one-third of all the individuals involved in these activities.

The vast majority of the refresher and job enhancement programs were reported by private organizations, utilities, government-owned contractor operated facilities, and by government agencies; however, one or more programs were reported by universities, medical facilities, and the military. Several government agencies and private organizations reported current or projected programs to train existing technicians employed in other government agencies or industries in basic radiation measurement and control, and in other nuclear related test and measurement techniques.

A very small number of existing technicians have virtually all of their skills rendered obsolete in any year, while a somewhat larger number find a part of their skills becoming obsolete. Technicians incurring obsolescence for a part of their skills may often be participants in the refresher and enhancement training in order to gain new skills. Those few technicians whose skills have become completely obsolete during any one year and who participated in retraining programs could be listed in either training leading to new supplies of nuclear related technicians or in training for refresher and enhancement purposes. These "obsolete technicians" would be in the new supply if they participated in institutional programs or in employer based training which develops individuals to fill additional nuclear related technician positions. The "obsolete technicians" would be listed in refresher and

TABLE IV.4

REPORTED EMPLOYER REFRESHER AND JOB ENHANCEMENT TRAINING ACTIVITIES
FOR EXISTING TECHNICIANS
WINB REGION

JOB CODE	TRAINING AREA	TIME REQUIREMENT (IN MONTHS)	NUMBER OF TECHNICIANS INVOLVED 1975	1976	1977	EMPLOYERS INVOLVED
101	Nuclear Reactor Operator	0.2-1.0	46	41	44	Universities (5), GOCO
103	Radioisotope Production	0.1-0.2	6	6	8	Industry (2)
104	Nuclear Power Plant Operator	1.7-4.5	25	0	3	Utilities (2)
105	Nuclear Material Processor	0.1	40	50	50	GOCO
109	Plutonium Handling	0.2	40	50	50	GOCO
111	Sodium Facility	0.2	150	150	150	GOCO
100	Other Nuclear Facility Technology	0.2-3.3	234	190	246	GOCOs (2)
SUBTOTAL REACTOR AND NUCLEAR FACILITY TECHNOLOGY		0.1-4.5	541	497	551	
201	Radiation Control	0.1-0.8	644	401	457	Government (6), GOCOs (3), Industry(5), Military, Medical
202	Radiochemistry	0.1-0.4	100	30	30	Industry (2)
203	Non-Destructive Testing	0.1-0.7	100	89	85	Industry (5), GOCO
204	Radiography	0.1-8.0	213	216	236	Industry (10), University
SUBTOTAL TEST AND MEASUREMENT TECHNOLOGY		0.1-8.0	1057	736	808	
301	Instrumentation and Control	0.1-0.2	0	1	0	GOCO, Industry, Government
302	Well-Logging	0.2-0.3	3	5	6	Industry (3)
SUBTOTAL INSTRUMENTATION TECHNOLOGY		0.1-0.3	3	6	6	
401	Radiology	0.1	115	50	60	Industry, Government
403	Nuclear Medical	0.1-0.5	3	1	1	Hospitals (3), Government
410	Radiobiology	0.1-0.2	71	71	71	Medical, University
SUBTOTAL NUCLEAR MEDICAL AND HEALTH TECHNOLOGY		0.1-0.5	189	122	132	
501	Soils Evaluation	0.1-1.1	99	128	150	Government (22), Industry (5), Private Labs (2)
505	Nuclear Welding Technology	1.2	0	1	0	Utility
506	Electronic & Instrumentation	0.1-0.5	10	4	5	Industry (3)
508	Metallurgy-Nuclear	0.3	0	1	0	Industry
500	Craft or Other Nuclear Related Technician	0.1	25	30	46	Industry, GOCO
SUBTOTAL CRAFT AND OTHER NUCLEAR RELATED TECHNOLOGY		0.1-1.2	134	164	201	
	GRAND TOTAL	0.1-8.0	1924	1525	1698	

enhancement type training activities if they were in employed based training and the employer did not report the training as filling a replacement or new nuclear related technician position.

V. ADDITIONAL DEMAND AND ADDITIONAL SUPPLY COMPARISONS

Data Adjustment for the Labor Market Forecast

The additional manpower requirements data must be refined before it can be used to make a labor market forecast. Replacement manpower needs are created by experienced workers leaving their old employment positions. If the ex-employees move out of the nuclear related technician supply in the western states (e.g., by retirement, death, withdrawal from the labor force, movement to non-nuclear related employment, geographic movement out of the western states, or upgrading to a new position above technician) then these replacement positions will require new technicians to fill them. New technician positions are not created when replacement needs are caused by experienced technicians simply changing employment within nuclear related positions.

To the extent that replacement needs are the result of experienced workers simply changing jobs within the nuclear field, the additional demand data overestimates the number of positions requiring new technicians. The actual amount of additional demand requiring new technicians that is present in the reported ten percent replacement manpower needs is not known; however, past studies* have shown a rate of attrition of seven percent from nuclear related technician positions. Data on attrition by individual job categories is not available, so the average figure of seven percent was applied to the replacement demands for all the technician job clusters in order to estimate an adjusted additional demand requirement (see table V.1). That is, any replacement needs over seven percent of the employment level are expected to be filled by experienced technicians changing jobs within the nuclear field.

The supply data, as noted before, also has some limitations. Not all trainees will enter the nuclear related field, but other non-reported sources of supply for nuclear related technicians do exist, e.g., entry to the technician ranks without formal training, experienced technicians moving into western states, and experienced technicians returning to nuclear related

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* The seven percent attrition rate was based on data for the private sector given in the *Nuclear Manpower Survey*, American Nuclear Society for the Division of Nuclear Education and Training, U. S. AEC, 1970. The B.L.S., in *Technician Manpower 1966-80*, Bulletin #1639, estimated attrition for all non-medical technicians at just over four percent. The higher rate of seven percent was used in this study, since it was specifically for nuclear related technicians and was a more current estimate.

work. Precise data on the size of these different adjustments to supply is missing. The effects would tend, however, to cancel out somewhat, so no general adjustment to the supply of new technicians was made.

A special adjustment had to be made in the projected supply of new non-destructive testing technicians. The military reported plans to train 555 new non-destructive testers (44 percent of the total) at locations in the western states, but did not report any additional positions for non-destructive testers. This military training, if included in the new supply, would strongly bias the labor market forecast; thus, only the civilian training of new non-destructive testing technicians was used in the supply and demand comparisons. The only other area with military based training is in the nuclear medical and health related field (less than 1/2 of 1 percent of the reported total training), and the military reported additional demand estimates for this cluster.

The analysis of labor market interactions must take into consideration the fact that in some organizations technician positions are filled, whenever possible, from the internal labor force; that is, technician job entry is limited first to current employees. The practice of restricting access to technician positions and related training in favor of the internal labor force results from company policies, union agreements, or legal mandates in the case of many government units. In those organizations using an internal labor market system, the supply of labor that is appropriate or relevant for use in manpower forecasts must be treated in two steps: first, internal supplies and second, external supplies for any remaining unfilled positions. These considerations do not affect the regional labor market forecasts, since employers have reported in-house programs used to train internal labor.

Finally, as mentioned previously, organizations not yet employing or training particular types of nuclear related technicians did report projected plans to commence employing or training such individuals for 1975 through 1977.

General Trends

A comparison of the projected trends in additional demand and additional supply of nuclear related technicians in the western states is presented in table V.1. The survey results provide a good indication of areas where excess or inadequate manpower supplies exist or appear to be developing in the nuclear related technician labor market. The comparisons are based on the

TABLE V.1

PROJECTED ADDITIONAL DEMAND AND ADDITIONAL SUPPLY COMPARISONS
BY JOB CLUSTER
NINB REGION

JOB CLUSTER	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977	JOB CODES AND TRAINING AREA CODES
Reactor Operation and Nuclear Production Technicians				
Adjusted Additional Demand	407	421	394	100-111
Reported Additional Supply	215	292	250	17.2001; 17.2004; 16.0115; 101; 102; 104-108
Demand Minus Supply*	+192	+129	+144	
Test and Measurement Technicians				
Adjusted Additional Demand	616	642	665	200-205
Reported Additional Supply(Civilian)	443	452	405	17.2002; 17.2003; 07.0902; 16.0105; 201-205
Demand Minus Supply*	+173	+190	+260	
Instrumentation Technicians				
Adjusted Additional Demand	123	135	140	301-303
Reported Additional Supply	134	150	173	16.0108; 16.0109; 16.0112; 301; 302
Demand Minus Supply*	- 11	- 15	- 33	
Nuclear Medical and Health Related Technicians				
Adjusted Additional Demand	971	1189	1170	400; 401; 403; 405-412
Reported Additional Supply	1571	1692	1799	07.0501; 07.0502; 07.0503; 16.0304; 401; 403; 407-412
Demand Minus Supply*	-600	-503	-629	

No Comparison Attempted For The "500" Job Cluster (Craft and other Nuclear-Related Technicians).

* + indicates excess demand and - indicates excess supply.

related occupation and training area clusters as developed in sections III and IV. Comparisons for selected individual categories are shown in table V.2.

In the reactor operation and nuclear production cluster, sizeable amounts of excess demand (inadequate supply) are projected for all three years. These shortages amount to 47 percent of the projected requirements for 1975, 31 percent for 1976 and 37 percent for 1977. If these projected shortages are not met they may have a significant deterring effect on nuclear reactor facility operations, since manpower requirements and training are closely monitored and controlled for many of these technician positions.*

The labor market forecast for test and measurement technicians shows a large amount of excess demand (inadequate supply). The manpower shortage projections increase from 28 percent in 1975 to 39 percent in 1977, almost as great as the shortages projected for the reactor operation and nuclear production technician cluster. The projected new supplies in the test and measurement cluster are only slightly larger than the projected number of new job openings, which leaves few new technicians to offset the substantial projected replacement needs. Relative levels of supply and demand for individual job categories vary considerably within this job cluster as shown in table IV.2. Forecasts for the test and measurement cluster are difficult to develop, since non-destructive testers can work in fields not requiring nuclear related activity.

The instrumentation technicians cluster has the lowest employment level and projected additional manpower needs. Additional demand and supply for this area appears to be approximately in balance in 1975 and 1976 with a slight amount of excess supply developing into a significant excess in 1977. Labor market projections for this job cluster are difficult to make because individuals trained in this area can find employment in many non-nuclear related industries.

For the total nuclear medical and health related field a sizeable excess supply of newly trained technicians appears to be a very probable occurrence for the next few years. The additional supplies range from 42 to 62 percent in excess of additional manpower requirements over the three-year projection period. The amount of excess supply decreases slightly from 1975

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* See the comments on nuclear reactor operator training sources in the *Demand and Supply for Selected Technician Categories* section of this chapter.

to 1976 but increases again in 1977. Relative supply and demand requirements in specific categories within the medical cluster vary widely with some areas having excess demand instead of excess supply, as shown in table V.2.

The only significant amount of employment data omitted from the survey response occurred in the nuclear medical and health related field. This would change the absolute numbers involved but would not be likely to change substantially the excess supply forecasts because the non-respondent medical facilities are also sources of technician training. The omitted additional demand data, therefore, would be balanced out to a large extent by omitted data on sources of training and new supply.

It should, also, be noted that based on national averages for full-time and part-time positions for nuclear medical and health related technicians,* as many as twenty percent of the additional positions may be for part-time employment. This demand for part-time workers causes a slight exaggeration in the true employment opportunities shown in the numbers of additional manpower requirements. This slight exaggeration would be, at least partially, offset by the response of some medical facilities for additional *full-time* technicians to work only part-time in nuclear related activities and the remainder in non-nuclear related activities. Several organizations reported their additional manpower requirements in full-time equivalent numbers (e.g., 0.5 for a full-time technician position requiring nuclear related work only one-half of the time), thus causing slightly lower counts for additional employee requirements than the number of people actually to be hired.

A labor market forecast was not attempted for craft and other nuclear related technicians cluster. As discussed in section IV, the supply data is less comprehensive and, thus, less reliable for this group of occupations. Also, workers in this job cluster are quite mobile between nuclear related and non-nuclear related employment. This ease of labor mobility, plus the less comprehensive data on training of new technicians, greatly reduces the usefulness of labor market comparisons in the craft and other nuclear related cluster.

Appendix C presents supply and demand comparisons for individual states. Note that the replacement demand data has not been adjusted in the individual

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* *The American College of Radiology Survey on Regionalization in Nuclear Medicine, A Report*, ARC Commission on Nuclear Medicine, March 1975.

state comparisons, since many of the job categories within individual states have very small reported numbers and since large deviations from the general average for net replacement needs may occur in local areas.

The labor market forecasts for individual states show several deviations from the regional results. The two job clusters with very high excess demand in the region (reactor operation and nuclear production, and test and measurement) had excess supplies reported in several states: Oregon and Utah for the reactor and nuclear production cluster, and Nevada and Oregon for the test and measurement cluster. California, also, had a projected excess supply in the test and measurement area; however, this is due to the presence of the military training for non-destructive testing. In the instrumentation cluster, which had an approximate labor market balance projected for 1975 and 1976, projections in three states show large excess supplies (Colorado, Oregon and Utah), and four states had projections of large excess demands (California, Idaho, New Mexico and Washington). Finally, in the nuclear medical and health related area, where large excess supplies were projected for the region, one-half of the states had projections showing some excess demand (Alaska, Arizona, Idaho, New Mexico, Oregon and Utah). These labor market forecasts for individual states must be viewed with considerable caution, since labor mobility across state boundaries will greatly affect the supply and demand interactions within any one state.

Demand and Supply for Selected Technician Categories

The projected supply and demand trends for a selected number of specific technician categories are presented in table V.2. The selected categories were chosen because of their particular significance to the nuclear field or to demonstrate divergent trends in supply and demand within job clusters. The selections were limited to those jobs that could be linked closely to particular training programs. Labor market forecasts are less reliable at the specific technician job level, since inter-job mobility is often possible within any job cluster.

Reactor and nuclear power plant operators are required to have considerable formalized and on-the-job training experience. Much of the training must be on the actual reactor to be operated on the job. Yet, the projected supply of new reactor operators is 36 to 58 percent below the projected manpower needs in the western states. Unless, a sizeable underreporting of training

TABLE V.2

PROJECTED ADDITIONAL DEMAND AND ADDITIONAL SUPPLY COMPARISONS
FOR SELECTED INDIVIDUAL OCCUPATIONS

WINB REGION

JOB CODE	OCCUPATION	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977	TRAINING AREA CODES
101 + 104	Reactor and Nuclear Power Plant Operator				
	Adjusted Additional Demand	50	138	83	
	Projected New Supply	28	88	35	101, 104, 17.2001
	Demand Minus Supply*	+ 22	+ 50	+ 48	
201	Radiation Control Technician				
	Adjusted Additional Demand	120	147	165	
	Projected New Supply	106	111	110	07.0902, 201
	Demand Minus Supply*	+ 14	+ 36	+ 55	
203	Non-Destructive Testing (NDT) Technician				
	Adjusted Additional Demand	218	235	195	
	Projected New Supply(Civilian)	225	253	215	17.2002, 203
	Demand Minus Supply*	- 7	- 18	- 20	
204	Radiographer				
	Adjusted Additional Demand	145	132	135	
	Projected New Supply	93	60	45	17.2003, 204
	Demand Minus Supply*	+ 52	+ 72	+ 90	
401 + 405 + 406 + 407	Radiology Related Technician				
	Adjusted Additional Demand	631	763	713	
	Projected New Supply	1300	1348	1433	07.0501, 16.0304, 401, 407
	Demand Minus Supply*	-669	-585	-720	
403	Nuclear Medical Technologist				
	Adjusted Additional Demand	215	286	292	
	Projected New Supply	201	238	249	07.0503, 403
	Demand Minus Supply*	+ 14	+ 48	+ 43	
408	Radiation Therapy Technician				
	Adjusted Additional Demand	51	69	70	
	Projected New Supply	62	76	82	07.0502, 408
	Demand Minus Supply	- 11	- 7	- 12	

* + indicates excess demand and - indicates excess supply.

has occurred (this would have to be for employer based training) or unless a large number of experienced or newly trained operators can be brought from other regions into the west, this projected manpower shortage may seriously affect nuclear power production in the near future. One possible source of unreported training for reactor operators would be in programs located outside of the western states, conducted by firms that build and supply nuclear reactors to utilities.

Three technician jobs within the test and measurement cluster are examined in table V.2. Radiation control and monitoring technician positions show an increasing amount of excess demand (inadequate supply) projected for the three-year forecast--a 33 percent shortage for 1977. Non-destructive testing and radiography are closely related work areas. But the labor market projections for the two areas show quite divergent trends; non-destructive testing has a projected small but increasing amount of excess supply, while radiography has a projected large and increasing amount of excess demand. A combined projection showing substantial excess demand for all three years is obtained by summing the supply and demand data for the two areas. It must be noted, again, that non-destructive testers have employment opportunities in non-nuclear related jobs (i.e., positions not requiring the use of nuclear related skills).

Three labor market comparisons were selected in the nuclear medical and health related cluster to show divergent manpower trends. The vast amount of excess supply projected for this job cluster is contained in the radiologic related positions: additional supply is 100 percent greater than additional demand in 1975 and 1977, and 75 percent greater in 1976. The nuclear medical technologist specialty has projections for manpower shortages which may be quite substantial for 1976 and 1977. Finally, for the relatively small area of radiation therapy, a slight excess in supply approaching a balanced labor market is projected for 1975-1977.

As was the case for job clusters, the labor market trends in any local area may diverge from the regional results for any of these specific job categories. As an example, the training available for nuclear medical technologists in Southern California appears quite adequate to meet the manpower requirements in this field in the near future.*

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* Results of an unpublished survey furnished to the survey research team by J. Walker, R.T. (ARRT), Assistant Professor, Radiologic Technology, Orange Coast College, Costa Mesa, California.

VI. COMPARISONS WITH OTHER SURVEYS

This is the first survey of this type in the western states, so past data based on the same format is not available. Comparisons, of a limited nature, are possible with other technician surveys covering employment growth and projections (see table IV,1).

TABLE VI,1

TECHNICIAN DEMAND COMPARISONS

		TECHNICIAN EMPLOYMENT LEVELS	
SURVEY	AREA	ACTUAL GROWTH PER YEAR	PROJECTED GROWTH PER YEAR
WINB (nuclear related technicians)	western states	-	10% (1975-1977)
SINB[a] (nuclear related technicians)	southern states	10% (1971-1973)	7-9% (1973-1976)
BLS[b] (technicians in the atomic energy field, non-medical and non-government)	national	4-5% (1968-1973)	-
ANS[c] (non-medical technicians in private sector of atomic energy field)	national	-	10% (1969-1973)
BLS[d] (all non-medical technicians)	national	- -	3.3% (1966-1980) 3.1% (1972-1985)

[a] *Nuclear Related Technician Survey for the Southern Interstate Nuclear Board, 1973*, Division of Labor Relations, U.S. AEC.

[b] *A Survey of Occupational Employment in the Atomic Energy Field* conducted by the Bureau of Labor Statistics, U.S. Department of Labor for the U.S. ERDA.

[c] *Nuclear Manpower Survey*, American Nuclear Society, Hinsdale, Illinois, 1970.

[d] *Technician Manpower 1966-1980*, Bulletin 1639 and *Occupational Manpower and Training Needs*, revised 1974, Bulletin 1824, Bureau of Labor Statistics, U.S. Department of Labor.

The projected growth in demand for nuclear related technicians in the western states is equal to the actual growth rate of nuclear related technician employment reported in the southern states for 1971-1973, and is slightly higher than the projected growth rate for that region for 1973-1976. The projected growth rate in the western states is equal to the growth rate projected by A.N.S. for non-medical technicians in the atomic energy field for the early 1970's.

Current employment growth rates for nuclear related technicians are projected at double the rate actually experienced from 1968 through 1973. These projections may reflect the impact of the recently expanded activity in the energy field. Projected growth rates for nuclear related technicians in the western states are three times greater than B.L.S. projections for technicians in general.

The 1973 nuclear related technician survey for southern states (the SINB region) contained additional manpower projections for 1975 and 1976. A comparison of these SINB region projections to the WINB region projections for 1975-1976, by job clusters, shows the SINB additional demand rate for the reactor operation and nuclear production cluster to be somewhat larger, while the WINB region has substantially higher additional demand rate projections for each of the other four job clusters.

A comparison of the projected labor market trends by job clusters for the SINB and WINB surveys finds agreement in three of the four job clusters. Both surveys found 1) significant amounts of inadequate manpower supply indicated for the reactor operation and nuclear production cluster, and for the test and measurement cluster, and 2) a large excess supply projected for the nuclear medical and health related cluster. The only disagreement between the two surveys was for the instrumentation job cluster where the SINB survey projected substantial excess supplies of manpower while the WINB survey indicated an approximately balanced labor market, tilted slightly towards excess supply.

APPENDICES

A. Letter and questionnaire used in the 1975 nuclear related technician survey in the WINB region.

B. State level manpower demand data.

Table B-1- Employment and Additional Manpower Needs by Occupation for each State.

Table B-2- State Level Employment and Additional Manpower Needs by Occupation.

C. Tables on additional demand and supply comparisons for each state.

D. List of training institutions reported in the WINB region by training area.

APPENDIX A

Letter and Questionnaire Used in the 1975 Nuclear Related Technician Survey in the WINB Region.

APPENDIX A

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

Dear Sir:

The U. S. Energy Research and Development Administration (ERDA) and The Western Interstate Nuclear Board (WINB), are cooperating in an effort to determine the current and anticipated supply of and demand for nuclear and radiation-related technicians in the West. This regional survey is designed to aid states and Federal agencies, educational institutions, and private industry by providing information needed for planning, recruitment, and training.

Your organization has been identified by the WINB, a state-supported service agency serving twelve (12) Western States, as a current or potential employer or source of training for nuclear or radiation technicians. As a part of its manpower information services, ERDA's Manpower Information Systems Branch, Division of Labor Relations, will handle the collection and collation of the nuclear related technician questionnaires in the Western Region. Future regional surveys are planned for other areas of the nation.

In order that we might develop the information essential to this project, we request your cooperation in completing the enclosed questionnaire(s). Data provided by your organization on the nuclear related technician survey form will be held in strict confidence as to individual employer. All organizations participating in the survey will be furnished with a copy of the survey report if desired.

We will appreciate your returning the completed questionnaire by February 14, 1975. If you have any questions concerning this matter, please get in touch with Larry L. Barker (301) 973-4396, who is coordinating the survey. Collect calls will be accepted.

Sincerely,

H. T. Herrick, Director
Division of Labor Relations

Enclosures:
As stated

GENERAL SURVEY INFORMATION

a. **Two survey forms** are included in this package. The first questionnaire asks for information on current employment and projected hiring needs within the nuclear related technician occupations, and for information on in-house or on-the-job training programs used to help meet your in-house labor force requirements. The second questionnaire requests information on training programs designed to supplying nuclear related technicians for other employers.

b. This survey is designed to gather information on **nuclear-related** technician employment and training. An explanation of what is meant by "nuclear-related technician" is contained in item 2 of both questionnaire forms (employment and training). Also, the list of occupations and training areas may be referred to for further information on what is meant by "nuclear-related technicians."

c. Forecasts of manpower replacement needs should be based on your best estimate of your firm's attrition rate. Forecasts of net growth in manpower needs should be based on your best estimate of your firm's future expansion and additional manpower requirements for the years specified.

EMPLOYMENT

If this establishment employs technicians this form should be completed.

DEMAND QUESTIONNAIRE

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
DIVISION OF LABOR RELATIONS
WASHINGTON, D.C. 20545

Form Approved:
OMB No. 38–R0180

A SURVEY OF NUCLEAR RELATED TECHNICIAN EMPLOYMENT

(Please change address or zip code if address on label is incorrect)

Please transfer address label from envelope

Organization_____

Street Address_____

City/State/Zip Code_____

Please respond by February 14, 1975

GENERAL INSTRUCTIONS

Please enter your best estimates of the number of **nuclear-related technicians** you will need for the "job titles and descriptions" and "years" listed on the following pages. When estimating manpower requirements consider both "new jobs" and "replacement" (deaths, retirements, and normal turnover) and enter the composite figure in the appropriate column. Also, please show your total anticipated requirements, even though a portion or all needs will be met through training within your own organization.

If you cannot relate the **nuclear-related technician** work performed in your establishment to the description contained herein, list your own job title and a description of the work performed on the blank spaces provided for that purpose. If you need more space than provided, please use an extra blank sheet.

PERSON TO BE CONTACTED IF QUESTIONS ARISE CONCERNING THIS REPORT:

_____ _____

Name and title *(please print or type)* Phone *(include Area Code)*

1. **All employers of nuclear related technicians responding to this survey will receive a copy of the final report.**

2. **SCOPE OF SURVEY**

For the purposes of this survey we are concerned with only those establishments which employ or anticipate employing technicians who need a core of nuclear related knowledge in order to perform their duties. This knowledge may come from exposure on the job, through specialized training or from formal education usually equivalent to two years beyond the high school level. A listing of nuclear related technician occupations is given in item 4.

Are any employees of this reporting unit engaged (or anticipated to be engaged) in nuclear related technician occupations, as defined in item 4, by January 1, 1977. YES ☐ NO ☐

3. **If you checked "Yes" above, please complete the remainder of the questionnaire.**
If you checked "No" please turn to the supply questionnaire.

4. NUCLEAR RELATED TECHNICIAN EMPLOYMENT *(Do not write in shaded areas. To avoid double counting, list each position by full-time equivalents.)*

1	3	3 → 10	11	12	13	14	15	16	17	18 → 21	22 → 25	26 → 29	30 → 33	34 → 37	38 → 41	42 → 45
CARD	COMPANY #		FOR YEAR		JOB CODE			SURVEY DATE		Job Titles and Descriptions for Reactor Operation and Production Technicians	Nuclear-Related Technician Employment as of January 1, 1975	Estimated Additional Technician Needs for the Calendar Year: 1975		1976		1977	
												Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)
11			74		1.01			75		**PRODUCTION, TEST OR RESEARCH REACTOR OPERATOR** – Performs hands-on operation of these reactors; requires certification by operating agency, or AEC Reactor Operator or Senior Reactor Operator License.							
					1.02					**ACCELERATOR OPERATOR** – Sets up or assists in setting up, coordinates, and monitors operation of particle accelerator under supervision of a research scientist.							
					1.03					**RADIOISOTOPE-PRODUCTION OPERATOR** – Prepares radioisotopes and other radioactive materials for use in biological, biochemical, physiological, and industrial establishments.							
					1.04					**NUCLEAR POWER PLANT OPERATOR** – Performs hands-on operation of nuclear power plant reactors; requires AEC Reactor Operator or Senior Reactor Operator License.							
					1.05					**NUCLEAR MATERIAL PROCESSOR, SENIOR** – Maintains and operates radioactive processing facilities; receives, transfers, and ships nuclear material; issues reactor fuels for research assemblies.							
					1.06					**HOT-CELL TECHNICIAN** – Operates, by remote-control, equipment in cell to perform chemical and metallurgical tests involving radioactive materials.							
					1.07					**NUCLEAR FACILITY EQUIPMENT OPERATOR** – Operates nuclear facility auxiliary equipment; does not require AEC operator license.							
					1.08					**NUCLEAR FACILITY MAINTENANCE TECHNICIAN** – Performs electrical and mechanical equipment maintenance on nuclear facility.							
					1.09					**PLUTONIUM (PU) HANDLING TECHNICIANS** – Works in Pu bldg. Must understand Pu, its general handling problems & associated potential hazards; handles Pu and Pu-contaminated apparatus; constructs various types of glove boxes and other facility equipment.							
↓ 11			↓ 74		Other – Please Describe			↓ 75									

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4. NUCLEAR RELATED TECHNICIAN EMPLOYMENT–Continued *(Do not write in shaded areas. To avoid double counting, list each position by full-time equivalents.)*

1	2	3→10	11	12	13 14 15	16	17		18→21	22→25	26→29	30→33	34→37	38→41	42→45
										Estimated Additional Technician Needs for the Calender Year:					
										1975		1976		1977	
CARD	COMPANY #	FOR YEAR			JOB CODE	SURVEY DATE		Job Titles and Descriptions for Test & Measurement Technicians	Nuclear-Related Technician Employment as of January 1, 1975	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)
11			74		2.01		75	**RADIATION CONTROL TECHNICIAN** – Monitors personnel, plant facilities, work environment, and plant vicinity to detect and control radioactivity and/or radiation exposure. Performs operation, analysis and calibration of radiation monitoring equipment.							
					2.02			**NUCLEAR FACILITY CHEMISTRY (RADIOCHEMISTRY) TECHNICIAN** – Performs all plant-related laboratory chemical analyses, including radiochemistry.							
					2.03			**NON-DESTRUCTIVE TESTING TECHNICIAN** – Performs NDT on nuclear facility equipment, including radiography, ultrasonics, dye penefram, magnetic particle and visual techniques.							
					2.04			**RADIOGRAPHER** – Controls equipment to take radiographs of metal castings, weldments, metal samples, etc., to detect flaws, porosity, and other properties. Selects radiation source & film, and applies math formulas to determine exposure distribution and time.							
					2.05			**NUCLEAR GEOLOGICAL TECHNICIAN** – Assists geologist in exploration for radioactive minerals, collecting samples, performing spectrum sampling, radon sampling, gamma ray logging, and log interpretation. Aids in preparation of geological reports and maps which identify location, concentration and distribution of radioactive minerals.							
					Other – Please Describe										
					Other – Please Describe										
11			74		Other – Please Describe		75								

4. NUCLEAR RELATED TECHNICIAN EMPLOYMENT—Continued *(Do not write in shaded areas. To avoid double counting, list each position by full-time equivalents.)*

1	2	3→10	11	12	13	14	15	16	17	18→21	22→25	26→29	30→33	34→37	38→41	42→46
CARD	COMPANY #		FOR YEAR		JOB CODE			SURVEY DATE		Job Titles and Descriptions for Nuclear Instrumentation Technicians	Nuclear-Related Technician Employment as of January 1, 1975	Estimated Additional Technician Needs for the Calendar Year: 1975		1976		1977	
												Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)
I1			74		3.01			75		**INSTRUMENTATION AND CONTROL TECHNICIAN** – Handles nuclear facility instrumentation and control system calibration and maintenance. (Includes computer maintenance.)							
					3.02					**WELL-LOGGING TECHNICIAN** – Conducts radioactive logging in the underground study of oil fields; maintains source instruments; evaluates data.							
					3.03					**X-RAY CALIBRATION TECHNICIAN** – Tests X-ray calibration, equipment reliability and safety; evaluates field and filter performance.							
I1			74		Other – Please Describe			75									
										Job Titles and Descriptions for Health-Related Nuclear Technicians							
I1			74		4.01			75		**RADIOLOGIC TECHNOLOGIST** – Applies roentgen and/or gamma rays to patients for diagnostic and therapeutic purposes.		—					
					4.03					**NUCLEAR MEDICAL TECHNOLOGIST** – Prepares, and measures radioactive isotopes in therapeutic, diagnostic, and tracer applications, utilizing variety of radioactive equipment.							
					4.05					**UROLOGY X-RAY TECHNICIAN** – Assists urologist in radiographic examinations of the urogenital tract.							
					4.06					**ORTHOPEDIC RADIOLOGIC TECHNICIAN** – Works with orthopedic surgeon in radiographic studies of skeletal system.							
					4.07					**SPECIAL PROCEDURES TECHNICIAN** – Performs those radiographic studies of blood vessels and nervous system which require special skills.							
I1			74		4.08			75		**RADIATION THERAPY TECHNICIAN** – Positions patients and applies X-ray or gamma radiation to predetermined anatomical areas with known malignant disease.							

4. NUCLEAR RELATED TECHNICIAN EMPLOYMENT—Continued *(Do not write in shaded areas. To avoid double counting, list each position by full-time equivalents.)*

1	2	3→10	11	12	13	14	15	16	17		18→21	22→25	26→29	30→33	34→37	38→41	42→45
												Estimated Additional Technician Needs for the Calendar Year:					
												1975		1976		1977	
CARD	COMPANY #		FOR YEAR		JOB CODE			SURVEY DATE		Job Titles and Descriptions for Health-Related Nuclear Technicians *(Con't)*	Nuclear-Related Technician Employment as of January 1, 1975	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)
11			74		4.09			75		**INTERNAL DOSIMETRY TECHNICIAN** — Conducts whole body counting, bioassay, and wound contamination analysis.							
					4.10					**RADIOBIOLOGY TECHNICIAN** — Tests for external and internal radiation effects in plants and animals.							
					4.11					**RADIOPHARMACIST** — Purchases pre-prepared radiopharmaceuticals and formulates all locally prepared radiopharmaceutical compounds.							
					4.12					**INHALATION TOXICOLOGY TECHNICIAN** — Semi-independent lab & field work requiring understanding of: anatomy & physiology of lung & airways, use of appropriate biomedical instruments, calibration of inhalation exposure chambers, experimental animal inhalation exposures, animal care in research, and data recording & analysis.							
11			74		Other — Please Describe			75									
										Job Titles and Descriptions for Nuclear-Related Technicians							
11			74		5.01			75		**SOILS EVALUATION TECHNICIAN** — Assesses soil density, radioactivity, and moisture content.							
					5.02					**DRAFTSMAN** — Performs routine tasks in preparing detailed nuclear engineering drawings, from work outlined by others.							
					5.03					**DATA PROCESSING OR COMPUTER PROGRAMMING TECHNICIAN** — Converts nuclear-related scientific, engineering, and other technical problem formulations to a format processed by computer.							
					5.04					**MECHANICAL AND STRUCTURAL TECHNICIAN** — Assists in design and fabrication of nuclear facility mechnical and structural equipment.							
11			74		5.05			75		**WELDING TECHNICIAN** — Performs specialized welding operations on nuclear components.							

4. NUCLEAR RELATED TECHNICIAN EMPLOYMENT–Continued *(Do not write in shaded areas. To avoid double counting, list each position by full-time equivalents.)*

1	2	3→10	11	12	13 14	15	16	17	18→21	22→23	24→27	28→31	32→35	36→39	40→43	44→47
CARD	COMPANY #		FOR YEAR	JOB CODE		SURVEY DATE	Job Titles and Descriptions for Nuclear-Related Technicians *(Con't)*	Nuclear-Related Technician Employment as of January 1, 1975	Estimated Additional Technician Needs for the Calender Year: 1975		1976		1977	
									Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)	Replacement (attrition)	New Positions (growth)
I1			74	5.06		75	**ELECTRONIC AND INSTRUMENT TECHNICIAN** – Performs various operations connected with fabricating, assembling, modifying, maintaining, and installing electronic equipment.							
				5.07			**QUALITY CONTROL AND/OR QUALITY ASSURANCE SPECIALIST** – Performs product evaluation, testing, and monitoring to insure strict adherence to nuclear product specifications.							
				5.08			**METALLURGICAL TECHNICIAN** – Assists metallurgist in investigation of properties of metal through microscopic, spectroscopic, X-ray & other studies to determine physical properties or find impurities or defects; testing alloys in tension, fatigue, etc., to insure compliance with prescribed standards. May calibrate & modify lab equip. for specific purpose.							
				5.09			**CERAMIC TECHNICIAN** – Assists engineer in research, design, process development, etc., of ceramic products. Conducts tests of physical, electrical, chemical & heat resisting properties of clays, silicas & similar materials. Tests finished products for durability, retractory heat and corrosion-resistant properties.							
				5.10			**VENTILATION TECHNICIAN** – Under supervision of ventilation engineer, installs & maintains ventilation fans & ducts in underground mines & nuclear facilities to keep air quality at acceptable levels.							
			Other – Please Describe											
			Other – Please Describe											
I1			74	Other – Please Describe		75								

5. IN-HOUSE OR ON-THE-JOB TRAINING PROGRAMS

5.1 Do you have in-house or on-the-job training programs for meeting in-house employment needs for nuclear-related technicians? YES ☐ NO ☐

5.2 If yes, please supply the following information in Table A and Table B. *(Table A should contain only those training programs designed for your own employment needs.)*

NOTE

IF YOU HAVE TRAINING PROGRAMS WHICH TRAIN INDIVIDUALS FOR NEEDS OUTSIDE THIS ESTABLISHMENT PLEASE LIST THESE PROGRAMS ON THE FORM ENTITLED "A SURVEY OF NUCLEAR RELATED TECHNICIAN TRAINING PROGRAMS," SUPPLY QUESTIONNAIRE.

5.3 Would you consider opening your training programs to those outside your organization on a cost-reimbursement basis? YES ☐ NO ☐

TABLE A

1	2	3→10	11	12	13	14	15	16	17	18	19→72	73→77	78→80			
CARD		COMPANY #	DATE		PGM	YEAR		IDENT.			14 ONLY	Length of Training Program in Hours	Number of Anticipated Graduates (if any) in Calendar Year:			
											Nuclear Related Job Title(s) for Which You Have Training Programs		1975	1976	1977	1978
13/14			75			74										
13/14																
13/14																
13/14																
13/14																

5.4 All other things being equal, would you hire graduates from public and private training institutions if they were available for the job titles listed above? YES ☐ NO ☐

5.5 If no, please explain in Table B. 39 ____

TABLE B

1	2	3→10	11	12	13→80
CARD		COMPANY #	YEAR		
C1			74		
C2					
C3					
C4					
C5					
C6					

5.6 Data supplied in Table "A" may be published by individual establishment. YES ☐ NO ☐ 40 ____

(Authorized Signature) *(Date)*

TRAINING

If this establishment has a nuclear-related technician training program which trains individuals for the needs of others this form should be completed.

SUPPLY QUESTIONNAIRE

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
DIVISION OF LABOR RELATIONS
WASHINGTON, D.C. 20545

Form Approved
OMB No. 38–R0180

A SURVEY OF NUCLEAR RELATED TECHNICIAN TRAINING PROGRAMS
(Training for the needs of others)

Organization _____

Street address _____

City/State/ZIP code _____

Please complete this block if address (location) is different than address on label transferred to address block on Demand Questionaire:

Please respond by February 14, 1975

GENERAL INSTRUCTIONS

Please enter your best estimates of the number of nuclear related technician graduates for "program descriptions" and "years" listed on the following pages. Space is provided for you to list any additional nuclear related technician training programs which may not be included in this questionnaire.

Provide information on nuclear related technician training program graduates which generally have the following characteristics:

1. The program is usually offered beyond the "secondary" but less than the "baccalaureate level."
2. The content is derived from technical skills and knowledge requirements of technical occupations.
3. Mathematics and the physical or biological sciences are integral parts of the program; technical study is mathematics and science based at all levels of the program.
4. Instruction is laboratory-oriented and makes use of many applications of the technical principles being studied. Emphasis is placed on analytical, rational thought processes in addition to the development of specific procedural techniques or skills.
5. The technical specialization is within an occupational field but is not confined to, or limited by, the requirements of any single job classification in any one industry. The Instruction is placed on technical skills and knowledge that have broad applications.

PERSON TO BE CONTACTED IF QUESTIONS ARISE CONCERNING THIS REPORT:

_____ _____

Name and title *(please print or type)* Phone *(include area code and ext.)*

1. **All trainers and educators of nuclear related technicians responding to this survey will receive a copy of the final report.**

2. **SCOPE OF SURVEY**

For the purposes of this survey we are concerned with only those establishments whose graduates (at the technician level) or anticipated graduates have a core of nuclear knowledge which would allow them to function in the nuclear field. Examples of technician training programs which produce these types of graduates are listed in Item 4.

Do any graduates of this establishment have a core of nuclear knowledge which would enable them to function at the technician level in the nuclear field? YES ☐ NO ☐

If you checked "Yes" please complete the remainder of the questionnaire. If you checked "No" please return the questionnaire to avoid further correspondence.

3. **TYPE OF ESTABLISHMENT IDENTIFICATION** *(Check one)*

- ☐ Type 1 – University
- ☐ Type 2 – Technical Institute
- ☐ Type 3 – Four-Year College
- ☐ Type 4 – Junior and/or Community College
- ☐ Type 5 – Training School operated by an industry for purposes other than their own labor supply
- ☐ Type 6 – Area Vocational School
- ☐ Type 7 – Private Vocational School
- ☐ Type 8 – Hospital
- ☐ Type 9 – Other _____ *(Please Specify)*

4. NUCLEAR RELATED TECHNICIAN TRAINING PROGRAMS
(To avoid double counting, do not report a student in more than one training program.)

1	2 3 → 10	11 12	13 → 43
T1		7 5	(SEE BELOW)

13 → 19 Program Code	Titles and Descriptions	20 → 23 Duration of Program (In Months)	24 → 27 Enrollment as of Jan. 1, 1975	28 → 31 32 → 35 36 → 39 40 → 43 Estimated Number of Graduates for the Calendar Years:			
				1974	1975	1976	1977
07.0501 (As Modified)	**RADIOLOGIC TECHNOLOGY** – A combination of subject matter and experiences designed to prepare a person for the safe use of X-ray and/or other radiation equipment in clinical settings under the supervision of a radiologist or other physician.						
07.0502	**RADIATION THERAPY** – A combination of subject matter and experiences designed to prepare a person to use radiation producing devices to administer therapeutic treatments as prescribed by a radiologist.						
07.0503	**NUCLEAR MEDICAL TECHNOLOGY** – A combination of subject matter and experiences designed to enable a person to prepare, administer, and measure radioactive isotopes in therapeutic, diagnostic, and tracer studies, utilizing a variety of radioisotope equipment.						
07.0902 (As Modified)	**RADIOLOGICAL HEALTH (HEALTH PHYSICS) TECHNICIAN**–A combination of subject matter and experiences designed to prepare a person to conduct radiological measurements and evaluations of exposure to X-ray, gamma, and alpha emitters and to recommend measures to insure maximum protection.						
16.0115 (As Modified)	**NUCLEAR TECHNOLOGY** – The subject matter emphasizes atomic and nuclear physics, nuclear reactor physics, nuclear reactor operations, health physics, shielding radioisotopes, chemistry, electronics, nuclear instrumentation and nuclear reactor safety.						
16.0304	**RADIOLOGIC TECHNOLOGY (X-RAY)** – A combination of subject matter and experiences designed to enable a person to prepare, administer, and measure radioactive isotopes in therapeutic, diagnostic studies, utilizing a variety of radioisotope equipment.						
17.2001	**INSTALLATION, OPERATION, AND MAINTENANCE OF REACTORS** – Organized learning experiences concerned with atomic reactor plants, their use, and related factors.						
17.2002	**NDT TECHNICIAN** – Training in radiography, ultrasonics, dye penetram, magnetic particle, and other techniques of NDT, including uses of spectrograph, spectrometer, densitometer, X-ray, sound-testing equipment.						
17.2003	**RADIOGRAPHY** – Organized learning experiences concerned with the installation, safe operation, interpretation, and maintenance of industrial X-ray equipment.						
17.2004	**INDUSTRIAL USES OF RADIOISOTOPES** – Organized learning experiences concerned with the industrial use of radioisotopes in production and control operations.						
Program Titles and Descriptions not Previously listed:							
Other – Please Specify Both the Title and Description							
Other – Please Specify Both the Title and Description							

4. NUCLEAR RELATED TECHNICIAN TRAINING PROGRAMS-CONTINUED

NOTE: The program titles and descriptions listed below do not refer to nuclear programs, as such, but rather to program areas that combine training in the nuclear field with training in a different area of specialization. *(To avoid double counting, do not report a student in more than one training program.)*

1	2 3	10 11	12 13	43
T1		7 8	(SEE BELOW)	

13–19 Program Code	Titles and Descriptions of Training Programs with a Nuclear Option	20–23 Duration of Program (In Months)	24–27 Enrollment as of Jan. 1, 1975	28–31 32–35 36–39 40–43 Estimated Number of Graduates for the Calendar Year:			
				1974	1975	1976	1977
16.0108 (As Modified)	**ELECTRONIC TECHNOLOGY (NUCLEAR OPTION)** – A combination of subject matter and experiences designed to prepare a person in fabricating, assembling, modifying and installing electronic equipment, with some additional training in the nuclear field.						
16.0109 (As Modified)	**ELECTROMECHANICAL TECHNOLOGY (NUCLEAR OPTION)** – Specialized classroom and laboratory learning experiences in both the mechanical and electrical fields. Instruction is planned to provide preparation for responsibilities concerned with the design, development, and testing of electromechanical devices and systems within the nuclear field.						
16.0105 (As Modified)	**CHEMICAL TECHNOLOGY (NUCLEAR OPTION)** – The subject matter emphasizes qualitative, quantitative and analytical analysis in general and organic chemistry. This program prepares the graduate to install, and operate pilot plants for chemical processes, and may be directly involved with the preparation of radioactive isotopes and other radioactive materials.						
16.0112 (As Modified)	**INSTRUMENTATION TECHNOLOGY (NUCLEAR OPTION)** – This program is planned to prepare the graduate to design, develop prototypes, test and evaluate control systems or automated systems, and prepare written reports in support of professional personnel. This program is concerned with instrumentation within the nuclear field.						
NOTE: Use the spaces below for program titles and descriptions with a nuclear option which were not listed previously.							
Other – Please Specify Both the Title and Description							
Other – Please Specify Both the Title and Description							
Other – Please Specify Both the Title and Description							
Other – Please Specify Both the Title and Description							
Other – Please Specify Both the Title and Description							
Other – Please Specify Both the Title and Description							

APPENDIX B

State Level Manpower Demand Data

Table B-1- Employment and Additional Manpower Needs by Occupation for each State.

Table B-2- State Level Employment and Additional Manpower Needs by Occupation.

TABLE B-1

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

STATE	EMPLOYMENT JANUARY 1, 1975	ADDITONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
101 Production, Test or Research Reactor Operator							
Arizona	3	3	0	3	0	3	1
California	64	4	3	7	2	5	3
Colorado	1	0	0	0	0	0	0
Idaho	47	7	0	5	0	5	0
New Mexico	8	0	3	1	1	0	1
Oregon	20	4	1	4	2	4	1
Washington	41	4	1	8	3	6	3
Totals	184	22	8	28	8	23	9
102 Accelerator Operator							
Arizona	1	0	0	0	0	1	0
California	106	6	6	8	13	10	27
Colorado	1	0	0	0	0	0	0
New Mexico	25	2	8	2	1	2	1
Utah	1	0	0	0	0	0	1
Washington	9	1	1	1	1	2	1
Totals	143	9	15	11	15	15	30
103 Radioisotope - Production Operator							
Arizona	1	0	1	0	0	0	1
California	66	14	13	12	6	14	6
Colorado	1	1	0	1	0	1	0
New Mexico	6	1	3	2	5	2	11
Oregon	2	0	0	1	1	1	0
Washington	4	1	1	0	0	0	0
Totals	80	17	18	16	12	18	18
104 Nuclear Power Plant Operator							
California	97	4	6	3	29	4	9
Colorado	15	0	2	0	0	0	0
Idaho	40	2	2	3	4	2	1
Oregon	25	2	2	2	2	2	2
Washington	19	1	4	1	65	8	27
Totals	196	9	16	9	100	16	39
105 Nuclear Material Processor, Senior							
California	13	0	1	1	2	1	3
Colorado	14	2	0	1	0	2	0
Idaho	25	1	0	1	0	1	3
Washington	19	2	3	2	3	2	2
Wyoming	50	5	2	5	0	5	0
Totals	121	10	6	10	5	11	8

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
106	Hot-Cell Technician							
	Arizona	2	0	0	0	1	0	0
	California	29	1	2	1	3	4	3
	Colorado	0	0	0	1	0	1	0
	Idaho.	117	9	4	9	5	9	7
	New Mexico	12	1	3	1	0	1	0
	Oregon	1	0	0	0	0	0	0
	Washington	16	0	0	1	0	1	1
	Totals	177	11	9	13	9	16	11
107	Nuclear Facility Equipment Operator							
	California	138	20	39	16	29	20	24
	Colorado	33	2	0	2	0	1	0
	Idaho	79	3	2	6	0	3	0
	Oregon	1	0	1	0	1	1	1
	Washington	268	24	26	26	5	29	11
	Totals	519	49	68	50	35	54	36
108	Nuclear Facility Maintenance Technician							
	California	146	3	15	5	13	4	7
	Colorado	211	11	12	12	6	13	6
	Idaho	79	5	12	4	0	4	0
	Oregon	16	0	4	1	0	1	0
	Washington	98	10	22	11	2	12	2
	Totals	550	29	65	33	21	34	15
109	Plutonium Handling Technician							
	California	22	1	12	1	9	3	13
	Colorado	501	35	0	40	0	30	0
	Idaho	16	1	0	0	1	0	0
	New Mexico	7	1	2	1	4	2	5
	Washington	90	8	3	9	5	9	4
	Totals	636	46	17	51	19	44	22
110	Tritium Handler							
	California	2	0	0	0	1	0	1
	Totals	2	0	0	0	1	0	1
111	Sodium Facility Technician							
	Washington	25	2	4	1	0	1	0
	Totals	25	2	4	1	0	1	0

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
100	Other Nuclear Test and Production Technician							
	California	6	2	1	2	0	2	0
	Colorado	1	0	1	1	0	1	0
	Totals	7	2	2	3	0	3	0
201	Radiation Control Technician							
	Arizona	13	1	1	1	3	0	5
	California	221	12	20	17	31	21	28
	Colorado	135	9	3	14	6	12	2
	Idaho	93	7	8	7	5	7	3
	Montana	0	0	1	0	0	0	0
	New Mexico	79	11	12	10	16	8	24
	Nevada	94	9	2	11	5	12	21
	Oregon	11	1	4	0	6	2	1
	Utah	4	0	0	0	0	0	1
	Washington	134	12	13	14	8	17	7
	Wyoming	15	2	0	2	1	3	1
	Totals	799	64	64	76	81	82	93
202	Nuclear Facility Chemistry (Radiochemistry) Technician							
	Arizona	0	0	0	0	0	0	3
	California	225	40	31	48	47	63	72
	Colorado	48	6	2	2	3	3	3
	Idaho	44	1	2	2	3	2	6
	Montana	1	0	0	0	0	0	0
	New Mexico	30	3	19	6	13	8	17
	Nevada	20	3	0	3	0	4	1
	Oregon	12	2	4	2	0	3	0
	Utah	2	0	0	0	0	0	1
	Washington	132	14	23	16	7	16	8
	Wyoming	4	1	1	1	0	1	5
	Totals	518	70	82	80	73	100	116
203	Non-Destructive Testing Technician							
	Arizona	2	0	0	0	1	0	2
	California	415	63	91	58	100	58	54
	Colorado	59	2	3	4	4	4	5
	Idaho	52	2	6	2	5	3	0
	New Mexico	12	1	1	1	0	1	0
	Nevada	1	0	0	0	0	0	0
	Oregon	55	7	6	6	4	6	2
	Utah	22	0	8	1	1	1	1
	Washington	136	19	38	29	34	33	34
	Wyoming	11	1	2	2	3	2	3
	States Not Reported	19	0	0	0	0	0	0
	Totals	784	95	155	103	152	108	101

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
204	Radiographer							
	Arizona	32	2	4	4	4	2	5
	California	339	31	58	32	45	42	38
	Colorado	61	2	6	6	5	4	6
	Idaho	5	1	1	1	1	1	1
	New Mexico	20	5	2	3	1	3	4
	Nevada	1	0	0	0	0	0	0
	Oregon	67	8	3	7	5	6	6
	Utah	10	0	0	0	0	0	0
	Washington	127	16	21	17	17	19	14
	State Not Reported	17	0	0	0	0	0	0
	Totals	679	65	95	70	78	77	74
205	Nuclear Geological Technician							
	Arizona	1	0	0	0	0	0	0
	California	5	1	4	0	2	1	2
	Colorado	16	7	8	5	3	3	5
	New Mexico	17	3	6	0	9	2	5
	Utah	1	0	1	0	0	0	1
	Washington	8	3	1	4	2	3	1
	Wyoming	19	1	1	1	4	1	3
	Totals	67	15	21	10	20	10	17
200	Nuclear Technical Custodian							
	California	13	0	2	0	1	0	0
	Colorada	5	0	0	0	0	0	0
	Totals	18	0	2	0	1	0	0
301	Instrumentation and Control Technician							
	Alaska	1	0	0	0	0	0	0
	Arizona	11	2	0	1	1	1	1
	California	89	5	14	8	13	7	29
	Colorado	25	2	2	2	1	2	1
	Idaho	91	4	6	3	5	2	4
	New Mexico	39	5	2	3	3	3	2
	Nevada	1	0	0	0	0	0	0
	Oregon	10	0	2	2	2	2	1
	Utah	2	0	3	1	6	2	6
	Washington	98	11	2	14	11	14	6
	Wyoming	6	0	0	3	0	0	0
	Totals	373	29	31	37	42	33	50

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
302	Well-Logging Technician							
	Alaska	16	1	3	1	3	0	0
	California	83	10	13	11	14	12	13
	Colorado	40	4	5	7	4	6	6
	Montana	3	0	0	0	0	0	0
	New Mexico	23	3	4	3	3	2	4
	Utah	2	0	0	0	0	0	0
	Washington	2	0	0	1	1	1	0
	Wyoming	52	3	10	3	4	4	4
	Totals	221	21	35	26	29	25	27
303	X-Ray Calibration Technician							
	California	22	1	6	1	5	4	5
	Colorado	1	1	0	0	1	0	0
	Idaho	1	0	0	0	0	0	0
	New Mexico	59	0	0	0	0	0	0
	Nevada	1	0	0	0	0	0	0
	Oregon	2	0	1	0	0	0	0
	Washington	5	1	2	1	1	1	2
	Wyoming	4	1	1	0	0	1	0
	Totals	95	4	10	2	7	6	7
401	Radiologic Technologist							
	Alaska	22	16	3	18	4	3	2
	Arizona	285	40	29	43	36	44	35
	California	1807	191	171	192	219	210	151
	Colorado	465	52	27	61	48	75	44
	Idaho	79	5	8	3	7	3	4
	Montana	40	12	5	8	3	9	3
	New Mexico	115	27	15	29	20	33	25
	Nevada	76	12	5	10	5	10	8
	Oregon	201	14	14	18	10	24	16
	Utah	43	13	5	13	6	14	10
	Washington	262	31	22	29	24	30	21
	Wyoming	23	2	1	2	1	2	2
	State Not Reported	3	0	0	1	0	0	1
	Totals	3421	415	305	427	383	457	322

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
403 Nuclear Medical Technologist							
Alaska	6	1	1	2	1	2	2
Arizona	47	7	7	10	13	11	13
California	532	67	92	86	112	84	122
Colorado	87	7	13	15	18	17	18
Idaho	13	0	3	0	4	3	0
Montana	5	1	0	1	5	3	1
New Mexico	25	5	4	7	6	6	6
Nevada	12	2	0	2	2	3	3
Oregon	75	6	11	8	15	10	17
Utah	21	2	14	5	9	5	9
Washington	53	9	7	9	15	9	12
Wyoming	6	1	1	0	0	1	1
State Not Reported	3	0	0	1	2	1	0
Totals	885	108	153	146	202	155	204
405 Urology X-Ray Technician							
Alaska	3	1	0	1	0	0	0
Arizona	2	0	0	0	0	0	0
California	56	1	3	3	6	3	6
Colorado	5	2	0	2	3	1	2
Idaho	1	0	0	0	0	0	0
Montana	1	1	0	0	0	1	0
New Mexico	1	0	0	0	0	0	0
Nevada	4	1	0	1	0	1	0
Washington	4	0	1	2	1	1	2
Totals	77	6	4	9	10	7	10
406 Orthopedic Radiologic Technician							
Alaska	3	1	0	1	0	0	0
Arizona	4	0	0	0	0	0	0
California	46	1	5	3	11	3	9
Colorado	7	2	1	5	2	2	4
Idaho	2	0	0	0	0	0	0
Montana	2	1	0	0	1	2	1
New Mexico	2	0	0	0	0	0	0
Nevada	1	0	0	0	1	0	0
Washington	2	0	1	1	2	0	1
State Not Reported	1	0	0	0	0	0	0
Totals	70	5	7	10	17	7	15

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
407	Special Procedures Technician							
	Alaska	4	2	0	2	1	2	0
	Arizona	16	2	3	3	3	5	2
	California	189	24	33	29	41	26	36
	Colorado	30	4	4	5	7	4	8
	Idaho	2	0	1	0	1	0	0
	Montana	5	2	0	2	3	1	2
	New Mexico	5	1	0	1	2	2	2
	Nevada	8	1	0	3	0	2	1
	Oregon	7	1	0	1	2	3	3
	Utah	8	1	0	2	0	2	3
	Washington	21	3	3	2	6	3	5
	Wyoming	2	0	0	0	0	1	0
	Totals	297	41	44	50	66	51	62
408	Radiation Therapy Technician							
	Alaska	1	1	0	1	0	1	0
	Arizona	18	0	3	0	5	1	4
	California	162	18	20	29	23	21	24
	Colorado	31	2	2	5	2	5	7
	Idaho	6	1	2	2	3	2	2
	Montana	2	1	0	0	2	2	0
	New Mexico	3	0	1	0	0	0	1
	Nevada	5	1	0	1	1	1	0
	Oregon	9	1	2	2	4	3	3
	Utah	9	1	2	3	0	1	2
	Washington	18	1	3	3	2	2	4
	Wyoming	1	1	0	0	0	1	0
	Totals	265	28	35	46	42	40	47
409	Internal Dosimetry Technician							
	Arizona	0	0	1	0	0	0	0
	California	15	1	2	0	3	2	3
	Colorado	8	1	0	1	1	1	0
	Montana	0	0	0	0	1	1	1
	New Mexico	7	2	2	1	2	1	2
	Nevada	3	0	0	0	0	1	1
	Washington	10	2	0	2	1	3	3
	Wyoming	2	0	0	0	0	0	0
	Totals	45	6	5	4	8	9	10

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
410	Radiobiology Technician							
	Arizona	2	0	1	1	1	0	0
	California	271	40	3	29	1	38	13
	Colorado	15	3	0	2	3	3	1
	Idaho	0	0	0	0	1	0	0
	Montana	0	0	0	0	0	0	1
	Nevada	16	2	0	2	0	1	1
	Utah	20	2	0	2	0	2	0
	Washington	15	1	1	1	1	1	1
	Wyoming	1	0	0	0	0	0	0
	Totals	340	48	5	37	7	45	17
411	Radiopharmacist							
	Arizona	1	0	2	0	1	0	2
	California	14	1	7	2	10	4	10
	Colorado	0	0	2	0	2	0	0
	Montana	0	0	0	0	0	0	1
	New Mexico	2	1	1	0	0	0	1
	Oregon	0	0	1	0	0	0	0
	Totals	17	2	13	2	13	4	14
412	Inhalation Toxicology Technician							
	California	9	1	0	2	1	3	1
	Colorado	2	0	0	0	1	1	0
	Montana	0	0	0	0	1	0	1
	New Mexico	30	3	15	5	10	6	10
	Washington	16	1	1	1	1	1	1
	Totals	57	5	16	8	14	11	13
400	Other Medical-Related (Nuclear) Technician							
	California	1	0	0	0	0	0	0
	Utah	1	0	0	0	0	0	0
	Totals	2	0	0	0	0	0	0

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
501	Soil Evaluation Technician							
	Alaska	9	3	6	5	0	5	0
	Arizona	113	8	5	10	11	6	6
	California	560	50	42	77	27	80	23
	Colorado	102	10	5	11	6	12	7
	Idaho	7	1	3	1	3	1	3
	New Mexico	24	4	4	4	2	4	3
	Nevada	55	7	15	7	11	7	3
	Oregon	137	20	0	29	12	27	13
	Washington	37	5	4	6	8	5	5
	Wyoming	6	1	0	1	0	1	0
	State Not Reported	1	0	0	0	0	0	0
	Totals	1071	109	84	151	80	148	63
502	Draftsman							
	California	207	21	29	19	42	18	29
	Colorado	18	8	4	8	8	9	10
	Idaho	69	7	8	6	6	7	3
	New Mexico	29	4	3	4	4	4	3
	Nevado	20	2	0	2	2	3	4
	Oregon	21	3	1	3	0	0	0
	Washington	47	6	11	9	6	7	4
	Totals	411	51	56	51	68	48	53
503	Data Processing or Computer Programming Technician							
	Alaska	1	0	0	0	0	0	0
	Arizona	1	0	0	0	0	0	1
	California	126	9	13	7	14	10	14
	Colorado	10	2	0	2	3	2	2
	Idaho	24	2	2	3	3	4	4
	New Mexico	8	0	2	1	1	0	0
	Nevada	24	2	0	3	2	4	4
	Utah	1	0	1	1	1	0	0
	Washington	32	3	1	4	2	4	4
	Wyoming	2	0	0	0	0	0	0
	Totals	229	18	19	21	26	24	29
504	Mechanical and Structural Technician							
	California	248	12	9	16	39	17	48
	Colorado	8	0	1	0	2	0	2
	Idaho	39	3	1	3	3	4	5
	New Mexico	191	15	10	15	10	15	10
	Nevada	6	0	0	1	1	1	1
	Washington	25	2	5	3	5	3	5
	Wyoming	1	0	0	0	0	0	0
	Totals	518	32	26	38	60	40	71

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
505 Welding Technician							
Arizona	3	0	0	0	0	0	0
California	122	20	21	20	56	29	74
Colorado	11	0	0	1	0	0	0
Idaho	48	4	2	4	3	4	4
New Mexico	5	1	1	1	1	1	1
Oregon	50	10	0	0	0	0	0
Utah	100	0	0	0	0	0	0
Washington	14	1	5	2	3	2	8
Totals	353	36	29	28	63	36	87
506 Electronic and Instrument Technician							
Alaska	3	1	0	0	0	0	0
Arizona	4	0	2	0	2	1	3
California	735	48	30	53	35	49	51
Colorado	61	8	4	8	4	10	5
Idaho	62	4	4	5	3	4	6
New Mexico	294	22	26	20	24	20	17
Nevada	527	25	0	27	50	27	102
Oregon	14	1	0	3	2	4	1
Utah	9	2	16	4	21	5	11
Washington	31	6	2	4	3	6	4
Wyoming	4	1	0	0	0	1	0
Totals	1744	118	84	124	144	127	200
507 Quality Control and/or Quality Assurance Specialist							
Arizona	10	0	0	0	0	0	1
California	242	29	28	24	42	25	50
Colorado	22	1	1	1	5	2	6
Idaho	7	2	1	0	0	1	0
New Mexico	20	1	3	1	5	0	4
Nevada	14	3	0	2	1	3	4
Oregon	27	2	3	2	2	2	1
Utah	12	0	4	1	4	1	2
Washington	30	3	7	3	9	4	13
Wyoming	8	1	0	1	0	1	0
State Not Reported	26	0	3	0	0	0	0
Totals	418	42	50	35	68	39	81

TABLE B-1 (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION FOR EACH STATE

	STATE	EMPLOYMENT JANUARY 1, 1975	ADDITIONAL MANPOWER NEEDS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
508	**Metallurgical Technician**							
	Arizona	4	0	1	0	0	0	0
	California	46	0	3	2	7	0	8
	Colorado	22	1	0	0	1	1	1
	Idaho	9	1	1	1	1	1	1
	New Mexico	23	0	5	0	1	0	1
	Oregon	15	1	0	1	1	1	1
	Washington	88	7	12	4	14	5	4
	State Not Reported	5	0	0	0	0	0	0
	Totals	212	10	22	8	25	8	16
509	**Ceramic Technician**							
	California	39	2	2	3	2	2	2
	New Mexico	7	0	2	0	1	0	1
	Oregon	3	1	0	1	1	1	1
	Washington	14	1	4	2	4	2	4
	Totals	63	4	8	6	8	5	8
510	**Ventilation Technician**							
	California	13	0	0	0	0	0	0
	Colorado	55	8	1	6	1	4	1
	New Mexico	19	2	3	0	4	0	2
	Utah	1	0	0	0	0	0	0
	Washington	2	0	0	0	1	1	0
	Wyoming	5	1	1	1	2	1	2
	Totals	95	11	5	7	8	6	5
500	**Other Craft-Related (Nuclear) Technician**							
	California	30	0	1	1	1	1	1
	Idaho	4	0	0	0	0	0	0
	Totals	34	[illegible]	1	1	1	1	1

TABLE B-2

ALASKA

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT January 1, 1975	ESTIMATED ADDITONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
301	Instrumentation and Control Technician	1	0	0	0	0	0	0
302	Well-Logging Technician	16	1	3	1	3	0	0
401	Radiologic Technologist	22	16	3	18	4	3	2
403	Nuclear Medical Technologist	6	1	1	2	1	2	2
405	Urology X-Ray Technician	3	1	0	1	0	0	0
406	Orthopedic Radiologic Technician	3	1	0	1	0	0	0
407	Special Procedures Technician	4	2	0	2	1	2	0
408	Radiation Therapy Technician	1	1	0	1	0	1	0
501	Soils Evaluation Technician	9	3	6	5	0	5	0
503	Data Processing or Computer Programming Technician	1	0	0	0	0	0	0
506	Electronic and Instrument Technician	3	1	0	0	0	0	0
	TOTALS FOR ALASKA	69	27	13	31	9	13	4

TABLE B-2

ARIZONA

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	3	3	0	3	0	3	1
102	Accelerator Operator	1	0	0	0	0	1	0
103	Radioisotope - Production Operator	1	0	1	0	0	0	1
106	Hot-Cell Technician	2	0	0	0	1	0	0
201	Radiation Control Technician	13	1	1	1	3	0	5
202	Nuclear Facility Chemistry (Radiochemistry) Technician	0	0	0	0	0	0	3
203	Non-Destructive Testing Technician	2	0	0	0	1	0	2
204	Radiographer	32	2	4	4	4	2	5
205	Nuclear Geological Technician	1	0	0	0	0	0	0
301	Instrumentation and Control Technician	11	2	0	1	1	1	1
401	Radiologic Technologist	285	40	29	43	36	44	35
403	Nuclear Medical Technologist	47	7	7	10	13	11	13
405	Urology X-Ray Technician	2	0	0	0	0	0	0
406	Orthopedic Radiologic Technician	4	0	0	0	0	0	0
407	Special Procedures Technician	16	2	3	3	3	5	2
408	Radiation Therapy Technician	18	0	3	0	5	1	4
409	Internal Dosimetry Technician	0	0	1	0	0	0	0
410	Radiobiology Technician	2	0	1	1	1	0	0
411	Radiopharmacist	1	0	2	0	1	0	2
501	Soils Evaluation Technician	113	8	5	10	11	6	6
503	Data Processing or Computer Programming Technician	1	0	0	0	0	0	1
505	Welding Technician	3	0	0	0	0	0	0
506	Electronic and Instrument Technician	4	0	2	0	2	1	3
507	Quality Control and/or Quality Assurance Specialist	10	0	0	0	0	0	1
508	Metallurgical Technician	4	0	1	0	0	0	0
	TOTALS FOR ARIZONA	576	65	60	76	82	75	85

TABLE B-2

CALIFORNIA

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS					
			1975		1976		1977	
			REPL.	NEW	REPL.	NEW	REPL.	NEW
101	Production, Test or Research Reactor Operator	64	4	3	7	2	5	3
102	Accelerator Operator	106	6	6	8	13	10	27
103	Radioisotope - Production Operator	66	14	13	12	6	14	6
104	Nuclear Power Plant Operator	97	4	6	3	29	4	9
105	Nuclear Material Processor, Senior	13	0	1	1	2	1	3
106	Hot-Cell Technician	29	1	2	1	3	4	3
107	Nuclear Facility Equipment Operator	138	20	39	16	29	20	24
108	Nuclear Facility Maintenance Technician	146	3	15	5	13	4	7
109	Plutionium Handling Technician	22	1	12	1	9	3	13
110	Tritiem Handler	2	0	0	0	1	0	1
100	Other Nuclear Test and Production Technician	6	2	1	2	0	2	0
201	Radiation Control Technician	221	12	20	17	31	21	28
202	Nuclear Facility Chemistry (Radiochemistry) Technician	225	40	31	48	47	63	72
203	Non-Destructive Testing Technician	415	63	91	58	100	58	54
204	Radiographer	339	31	58	32	45	42	38
205	Nuclear Geological Technician	5	1	4	0	2	1	2
200	Nuclear Technical Custodian	13	0	2	0	1	0	0
301	Instrumentation and Control Technician	89	5	14	8	13	7	29
302	Well-Logging Technician	83	10	13	11	14	12	13
303	X-Ray Calibration Technician	22	1	6	1	5	4	5
401	Radiologic Technologist	1807	191	171	192	219	210	151
403	Nuclear Medical Technologist	532	67	92	86	112	84	122
405	Urology X-Ray Technician	56	1	3	3	6	3	6
406	Orthopedic Radiologic Technician	46	1	5	3	11	3	9
407	Special Procedures Technician	189	24	33	29	41	26	36
408	Radiation Therapy Technician	162	18	20	29	23	21	24
409	Internal Dosimetry Technician	15	1	2	0	3	2	3
410	Radiobiology Technician	271	40	3	29	1	38	13
411	Radiopharmacist	14	1	7	2	10	4	10
412	Inhalation Toxicology Technician	9	1	0	2	1	3	1
400	Other Medical-Related (Nuclear) Technician	1	0	0	0	0	0	0
501	Soils Evaluation Technician	560	50	42	77	27	80	23
502	Draftsman	207	21	29	19	42	18	29
503	Data Processing or Computer Programming Technician	126	9	13	7	14	10	14

TABLE B-2

CALIFORNIA (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS					
			1975		1976		1977	
			REPL.	NEW	REPL.	NEW	REPL.	NEW
504	Mechanical and Structural Technician	248	12	9	16	39	17	48
505	Welding Technician	122	20	21	20	56	29	74
506	Electronic and Instrument Technician	735	48	30	53	35	49	51
507	Quality Control and/or Quality Assurance Specialist	242	29	28	24	42	25	50
508	Metallurgical Technician	46	0	3	2	7	0	8
509	Ceramic Technician	39	2	2	3	2	2	2
510	Ventilation Technician	13	0	0	0	0	0	0
500	Other Craft-Related (Nuclear) Technician	30	0	1	1	1	1	1
	TOTALS FOR CALIFORNIA	7571	754	851	828	1057	900	1012

TABLE B-2

COLORADO

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1966 REPL.	1966 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	1	0	0	0	0	0	0
102	Accelerator Operator	1	0	0	0	0	0	0
103	Radioisotope - Production Operator	1	1	0	1	0	1	0
104	Nuclear Power Plant Operator	15	0	2	0	0	0	0
105	Nuclear Material Processor, Senior	14	2	0	1	0	2	0
106	Hot-Cell Technician	0	0	0	1	0	1	0
107	Nuclear Facility Equipment Operator	33	2	0	2	0	1	0
108	Nuclear Facility Maintenance Technician	211	11	12	12	6	13	6
109	Plutonium Handling Technician	501	35	0	40	0	30	0
100	Other Nuclear Test and Production Technician	1	0	1	1	0	1	0
201	Radiation Control Technician	135	9	3	14	6	12	2
202	Nuclear Facility Chemistry (Radiochemistry) Technician	48	6	2	2	3	3	3
203	Non-Destructive Testing Technician	59	2	3	4	4	4	5
204	Radiographer	61	2	6	6	5	4	6
205	Nuclear Geological Technician	16	7	8	5	3	3	5
200	Nuclear Technical Custodian	5	0	0	0	0	0	0
301	Instrumentation and Control Technician	25	2	2	2	1	2	1
302	Well-Logging Technician	40	4	5	7	4	6	6
303	X-Ray Calibration Technician	1	1	0	0	1	0	0
401	Radiologic Technologist	465	52	27	61	48	75	44
403	Nuclear Medical Technologist	87	7	13	15	18	17	18
405	Urology X-Ray Technician	5	2	0	2	3	1	2
406	Orthopedic Radiologic Technician	7	2	1	5	2	2	4
407	Special Procedures Technician	30	4	4	5	7	4	8
408	Radiation Therapy Technician	31	2	2	5	2	5	7
409	Internal Dosimetry Technician	8	1	0	1	1	1	0
410	Radiobiology Technician	15	3	0	2	3	3	1
411	Radiopharmacist	0	0	2	0	2	0	0
412	Inhalation Toxicology Technician	2	0	0	0	1	1	0
501	Soils Evaluation Technician	102	10	5	11	6	12	7

TABLE B-2

COLORADO (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
502	Draftsman	18	8	4	8	8	9	10
503	Data Processing or Computer Programmming Technician	10	2	0	2	3	2	2
504	Mechanical and Structural Technician	8	0	1	0	2	0	2
505	Welding Technician	11	0	0	1	0	0	0
506	Electronic and Instrument Technician	61	8	4	8	4	10	5
507	Quality Control and/or Quality Assurance Specialist	22	1	1	1	5	2	6
508	Metallurgical Technician	22	1	0	0	1	1	1
510	Ventilation Technician	55	8	1	6	1	4	1
	TOTALS FOR COLORADO	2127	195	109	231	150	232	152

TABLE B-2

IDAHO

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	47	7	0	5	0	5	0
104	Nuclear Power Plant Operator	40	2	2	3	4	2	1
105	Nuclear Material Processor, Senior	25	1	0	1	0	1	3
106	Hot-Cell Technician	117	9	4	9	5	9	7
107	Nuclear Facility Equipment Operator	79	3	2	6	0	3	0
108	Nuclear Facility Maintenance Technician	79	5	12	4	0	4	0
109	Plutonium Handling Technician	16	1	0	0	1	0	0
201	Radiation Control Technician	93	7	8	7	5	7	3
202	Nuclear Facility Chemistry (Radiochemistry) Technician	41	1	2	2	3	2	6
203	Non-Destructive Testing Technician	52	2	6	2	5	3	0
204	Radiographer	5	1	1	1	1	1	1
301	Instrumentation and Control Technician	91	4	6	3	5	2	4
303	X-Ray Calibration Technician	1	0	0	0	0	0	0
401	Radiologic Technologist	79	5	8	3	7	3	4
403	Nuclear Medical Technologist	13	0	3	0	4	3	0
405	Urology X-Ray Technician	1	0	0	0	0	0	0
406	Orthopedic Radiologic Technician	2	0	0	0	0	0	0
407	Special Procedures Technician	2	0	1	0	1	0	0
408	Radiation Therapy Technician	6	1	2	2	3	2	2
410	Radiobiology Technician	0	0	0	0	1	0	0
501	Soils Evaluation Technician	27	1	3	1	3	1	3
502	Draftsman	69	7	8	6	6	7	3
503	Data Processing or Computer Programmming Technician	24	2	2	3	3	4	4
504	Mechanical and Structural Technician	39	3	1	3	3	4	5
505	Welding Technician	48	4	2	4	3	4	4
506	Electronic and Instrument Technician	62	4	4	5	3	4	6
507	Quality Control and/or Quality Assurance Specialist	7	2	1	0	0	1	0
508	Metallurgical Technician	9	1	1	1	1	1	1
500	Other Craft-Related (Nuclear) Technician	4	0	0	0	0	0	0
	TOTALS FOR IDAHO	1081	73	79	71	67	73	57

TABLE B-2

MONTANA

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
201	Radiation Control Technician	0	0	1	0	0	0	0
202	Nuclear Facility Chemistry (Radiochmistry) Technician	1	0	0	0	0	0	0
302	Well-Logging Technician	3	0	0	0	0	0	0
401	Radiologic Technologist	40	12	5	8	3	9	3
403	Nuclear Medical Technologist	5	1	0	1	5	3	1
405	Urology X-Ray Technician	1	1	0	0	0	1	0
406	Orthopedic Radiologic Technician	2	1	0	0	1	2	1
407	Special Procedures Technician	5	2	0	2	3	1	2
408	Radiation Therapy Technician	2	1	0	0	2	2	0
409	Internal Dosimetry Technician	0	0	0	0	1	1	1
410	Radiobiology Technician	0	0	0	0	0	0	1
411	Radiopharmacist	0	0	0	0	0	0	1
412	Inhalation Toxicology Technician	0	0	0	0	1	0	1
	TOTALS FOR MONTANA	59	18	6	11	16	19	11

TABLE B-2

NEVADA

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
201	Radiation Control Technician	94	9	2	11	5	12	21
202	Nuclear Facility Chemistry (Radiochemistry) Technician	20	3	0	3	0	4	1
203	Non-Destructive Testing Technician	1	0	0	0	0	0	0
204	Radiographer	1	0	0	0	0	0	0
301	Instrumentation and Control Technician	1	0	0	0	0	0	0
303	X-Ray Calibration Technician	1	0	0	0	0	0	0
401	Radiologic Technologist	76	12	5	10	5	10	8
403	Nuclear Medical Technologist	12	2	0	2	2	3	3
405	Urology X-Ray Technician	4	1	0	1	0	1	0
406	Orthopedic Radiologic Technician	1	0	0	0	1	0	0
407	Special Procedures Technician	8	1	0	3	0	2	1
408	Radiation Therapy Technician	5	1	0	1	1	1	0
409	Internal Dosimetry Technician	3	0	0	0	0	1	1
410	Radiobiology Technician	16	2	0	2	0	1	1
501	Soils Evaluation Technician	55	7	15	7	11	7	3
502	Draftsman	20	2	0	2	2	3	4
503	Data Processing or Computer Programming Technician	24	2	0	3	2	4	4
504	Mechanical and Structural Technician	6	0	0	1	1	1	1
506	Electronic and Instument Technician	527	25	0	27	50	27	102
507	Quality Control and/or Quality Assurance Specialist	14	3	0	2	1	3	4
	TOTALS FOR NEVADA	889	70	22	75	81	80	154

TABLE B-2

NEW MEXICO

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1966 REPL.	1966 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	8	0	3	1	1	0	1
102	Accelerator Operator	25	2	8	2	1	2	1
103	Radioisotope - Production Operator	6	1	3	2	5	2	11
106	Hot-Cell Technician	12	1	3	1	0	1	0
109	Plutonium Handling Technician	7	1	2	1	4	2	5
201	Radiation Control Technician	79	11	12	10	16	8	24
202	Nuclear Facility Chemistry (Radiochemistry) Technician	30	3	19	6	13	8	17
203	Non-Destructive Testing Technician	12	1	1	1	0	1	0
204	Radiographer	20	5	2	3	1	3	4
205	Nuclear Geological Technician	17	3	6	0	9	2	5
301	Instrumentation and Control Technician	39	5	2	3	3	3	2
302	Well-Logging Technician	23	3	4	3	3	2	4
303	X-Ray Calibration Technician	59	0	0	0	0	0	0
401	Radiologic Technologist	115	27	15	29	20	33	25
403	Nuclear Medical Technologist	25	5	4	7	6	6	6
405	Urology X-Ray Technician	1	0	0	0	0	0	0
406	Orthopedic Radiologic Technician	2	0	0	0	0	0	0
407	Special Procedures Technician	5	1	0	1	2	2	2
408	Radiation Therapy Technician	3	0	1	0	0	0	1
409	Internal Dosimetry Technician	7	2	2	1	2	1	2
411	Radiopharmacist	2	1	1	0	0	0	1
412	Inhalation Toxicology Technician	30	3	15	5	10	6	10
501	Soils Evaluation Technician	24	4	4	4	2	4	3
502	Draftsman	29	4	3	4	4	4	3
503	Data Processing or Computer Programming Technician	8	0	2	1	1	0	0
504	Mechanical and Structural Technician	191	15	10	15	10	15	10
505	Welding Technician	5	1	1	1	1	1	1
506	Electronic and Instrument Technician	294	22	26	20	24	20	17
507	Quality Control and/or Quality Assurance Specialist	20	1	3	1	5	0	4
508	Metallurgical Technician	23	0	5	0	1	0	1
509	Ceramic Technician	7	0	2	0	1	0	1
510	Ventilation Technician	19	2	3	0	4	0	2
	TOTALS FOR NEW MEXICO	1147	124	162	122	149	126	163

TABLE B-2

OREGON

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	20	4	1	4	2	4	1
103	Radioisotope - Production Operator	2	0	0	1	1	1	0
104	Nuclear Power Plant Operator	25	2	2	2	2	2	2
106	Hot-Cell Technician	1	0	0	0	0	0	0
107	Nuclear Facility Equipment Operator	1	0	1	0	1	1	1
108	Nuclear Facility Maintenance Technician	16	0	4	1	0	1	0
201	Radiation Control Technician	11	1	4	0	6	2	1
202	Nuclear Facility Chemistry (Radiochemistry) Technician	12	2	4	2	0	3	0
203	Non-Destructive Testing Technician	55	7	6	6	4	6	2
204	Radiographer	67	8	3	7	5	6	6
301	Instrumentation and Control Technician	10	0	2	2	2	2	1
303	X-Ray Calibration Technician	2	0	1	0	0	0	0
401	Radiologic Technologist	201	14	14	18	10	24	16
403	Nuclear Medical Technologist	75	6	11	8	15	10	17
407	Special Procedures Technician	7	1	0	1	2	3	3
408	Radiation Therapy Technician	9	1	2	2	4	3	3
411	Radiopharmacist	0	0	1	0	0	0	0
501	Soils Evaluation Technician	137	20	0	29	12	27	13
502	Draftsman	21	3	1	3	0	0	0
505	Welding Technician	50	10	0	0	0	0	0
506	Electronic and Instrument Technician	14	1	0	3	2	4	1
507	Quality Control and/or Quality Assurance Specialist	27	2	3	2	2	2	1
508	Metallurgical Technician	15	1	0	1	1	1	1
509	Ceramic Technician	3	1	0	1	1	1	1
	TOTALS FOR OREGON	781	84	60	93	72	103	70

TABLE B-2

UTAH

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975		1976		1977	
			REPL.	NEW	REPL.	NEW	REPL.	NEW
102	Accelerator Operator	1	0	0	0	0	0	1
201	Radiation Control Technician	4	0	0	0	0	0	1
202	Nuclear Facility Chemistry (Radiochemistry) Technician	2	0	0	0	0	0	1
203	Non-Destructive Testing Technician	22	0	8	1	1	1	1
204	Radiographer	10	0	0	0	0	0	0
205	Nuclear Geological Technician	1	0	1	0	0	0	1
301	Instrumentation and Control Technician	2	0	3	1	6	2	6
302	Well-Logging Technician	2	0	0	0	0	0	0
401	Radiologic Technologist	43	13	5	13	6	14	10
403	Nuclear Medical Technologist	21	2	14	5	9	5	9
407	Special Procedures Technician	8	1	0	2	0	2	3
408	Radiation Therapy Technician	9	1	2	3	0	1	2
410	Radiobiology Technician	20	2	0	2	0	2	0
400	Other Medical-Related (Nuclear) Technician	1	0	0	0	0	0	0
503	Data Processing or Computer Programmming Technician	1	0	1	1	1	0	0
505	Welding Technician	100	0	0	0	0	0	0
506	Electronic and Instrument Technician	9	2	16	4	21	5	11
507	Quality Control and/or Quality Assurance Specialist	12	0	4	1	4	1	2
510	Ventilation Technician	1	0	0	0	0	0	0
	TOTALS FOR UTAH	269	21	54	33	48	33	48

TABLE B-2

WASHINGTON

EMPLOYMENT AND ADDITONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDTIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
101	Production, Test or Research Reactor Operator	41	4	1	8	3	6	3
102	Accelerator Operator	9	1	1	1	1	2	1
103	Radioisotope - Production Operator	4	1	1	0	0	0	0
104	Nuclear Power Plant Operator	19	1	4	1	65	8	27
105	Nuclear Material Processor, Senior	19	2	3	2	3	2	2
106	Hot-Cell Technician	16	0	0	1	0	1	1
107	Nuclear Facility Equipment Operator	268	24	26	26	5	29	11
108	Nuclear Facility Maintenance Technician	98	10	22	11	2	12	2
109	Plutonium Handling Technician	90	8	3	9	5	9	4
111	Sodium Facility Technician	25	2	4	1	0	1	0
201	Radiation Control Technician	134	12	13	14	8	17	7
202	Nuclear Facility Chemistry (Radiochemistry) Technician	132	14	23	16	7	16	8
203	Non-Destructive Testing Technician	136	19	38	29	34	33	34
204	Radiographer	127	16	21	17	17	19	14
205	Nuclear Geological Technician	8	3	1	4	2	3	1
301	Instrumentation and Control Technician	98	11	2	14	11	14	6
302	Well-Logging Technician	2	0	0	1	1	1	0
303	X-Ray Calibration Technician	5	1	2	1	1	1	2
401	Radiologic Technologist	262	31	22	29	24	30	21
403	Nuclear Medical Technologist	53	9	7	9	15	9	12
405	Urology X-Ray Technician	4	0	1	2	1	1	2
406	Orthopedic Radiologic Technician	2	0	1	1	2	0	1
407	Special Procedures Technician	21	3	3	2	6	3	5
408	Radiation Therapy Technician	18	1	3	3	2	2	4
409	Internal Dosimetry Technician	10	2	0	2	1	3	3
410	Radiobiology Technician	15	1	1	1	1	1	1
412	Inhalation Toxicology Technician	16	1	1	1	1	1	1
501	Soils Evaluation Technician	37	5	4	6	8	5	5
502	Draftsman	47	6	11	9	6	7	4
503	Data Processing or Computer Programming Technician	32	3	1	4	2	4	4

TABLE B-2

WASHINGTON (CON'T)

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITONAL MANPOWER REQUIREMENTS 1975		1976		1977	
			REPL.	NEW	REPL.	NEW	REPL.	NEW
504	Mechanical and Structural Technician	25	2	5	3	5	3	5
505	Welding Technician	14	1	5	2	3	2	8
506	Electronic and Instrument Technician	31	6	2	4	3	6	4
507	Quality Control and/or Quality Assurance Specialist	30	3	7	3	9	4	13
508	Metallurgical Technician	88	7	12	4	14	5	4
509	Ceramic Technician	14	1	4	2	4	2	4
510	Ventilation Technician	2	0	0	0	1	1	0
	TOTALS FOR WASHINGTON	1952	211	255	243	273	263	224

TABLE B-2

WYOMING

EMPLOYMENT AND ADDITONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
105	Nuclear Material Processor, Senior	50	5	2	5	0	5	0
201	Radiation Control Technician	15	2	0	2	1	3	1
202	Nuclear Facility Chemistry (Radiochemistry) Technician	4	1	1	1	0	1	5
203	Non-Destructive Testing Technician	11	1	2	2	3	2	3
205	Nuclear Geological Technician	19	1	1	1	4	1	3
301	Instrumentation and Control Technician	6	0	0	3	0	0	0
302	Well-Logging Technician	52	3	10	3	4	4	4
303	X-Ray Calibration Technician	4	1	1	0	0	1	0
401	Radiologic Technologist	23	2	1	2	1	2	2
403	Nuclear Medical Technologist	6	1	1	0	0	1	1
407	Special Procedures Technician	2	0	0	0	0	1	0
408	Radiation Therapy Technician	1	1	0	0	0	1	0
409	Internal Dosimetry Technician	2	0	0	0	0	0	0
410	Radiobiology Technician	1	0	0	0	(	0	0
501	Soils Evaluation Technician	6	1	0	1	0	1	0
503	Data Processing or Computer Programming Technician	2	0	0	0	0	0	0
504	Mechanical and Structural Technician	1	0	0	0	0	0	0
506	Electronic and Instrument Technician	4	1	0	0	0	1	0
507	Quality Control and/or Quality Assurance Specialist	8	1	0	1	0	1	0
510	Ventilation Technician	5	1	1	1	2	1	2
	TOTALS FOR WYOMING	222	22	20	22	15	26	21

TABLE B-2

STATE NOT REPORTED

EMPLOYMENT AND ADDITIONAL MANPOWER NEEDS
BY OCCUPATION

CODE	JOB TITLE	NUCLEAR RELATED TECHNICIAN EMPLOYMENT JANUARY 1, 1975	ESTIMATED ADDITIONAL MANPOWER REQUIREMENTS 1975 REPL.	1975 NEW	1976 REPL.	1976 NEW	1977 REPL.	1977 NEW
203	Non-Destructive Testing Technician	19	0	0	0	0	0	0
204	Radiographer	17	0	0	0	0	0	0
401	Radiologic Technologist	3	0	0	1	0	0	1
403	Nuclear Medical Technologist	3	0	0	1	2	1	0
406	Orthopedic Radiologic Technician	1	0	0	0	0	0	0
501	Soils Evaluation Technician	1	0	0	0	0	0	0
507	Quality Control and/or Quality Assurance Specialist	26	0	3	0	0	0	0
508	Metallurgical Technician	5	0	0	0	0	0	0
	TOTALS FOR STATE NOT REPORTED	75	0	3	2	2	1	1

APPENDIX C

Tables on Additional Demand and Supply Comparisons for Each State

Alaska
Arizona
California
Colorado
Idaho
Montana
Nevada
New Mexico
Oregon
Utah
Washington
Wyoming

NOTE: The replacement demand data has not been adjusted in these individual states' supply and demand comparisons (see the discussion of adjusted demand for the region in the section *General Trends* of Chapter V). Adjustment of the replacement demand is not possible, since many of the job categories within individual states have very small reported numbers and since large deviations from the general average for net replacement needs may occur in local areas.

TABLE C

ALASKA

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTERS

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTERS AND TRAINING AREAS	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Instrumentation Technology			
301-302	Total Additional Demand	4	4	0
	Total Additional Supply	3	2	0
302	Well Logging	3	2	0
	Demand Minus Supply*	+1	+2	0
	Nuclear Medical and Health-Related Technology			
400-412	Total Additional Demand	26	31	12
	Total Additional Supply	0	0	1
403	Nuclear Medical	0	0	1
	Demand Minus Supply*	+26	+31	+11

* + indicates excess demand

TABLE C

ARIZONA

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975		1976		1977	
	Reactor Operation and Nuclear Production Technology						
100-111	Total Additional Demand	4		4		6	
	Total Additional Supply	3		3		3	
101	Reactor Operator		3		3		3
	Demand Minus Supply*	+1		+1		+3	
	Test and Measurement Technology						
200-205	Total Additional Demand	8		13		17	
	Total Additional Supply	1		1		1	
204	Radiography		1		1		1
	Demand Minus Supply*	+7		+12		+16	
	Instrumentation Technology						
301-302	Total Additional Demand	2		2		2	
	Total Additional Supply	0		0		0	
	Demand Minus Supply*	+2		+2		+2	
	Nuclear Medical and Health Related Technology						
400-412	Total Additional Demand	95		116		117	
	Total Additional Supply	96		108		111	
07.0501; 401	Radiology		92		101		105
07.0503; 403	Nuclear Medical		3		3		2
07.0502	Radiation Therapy		1		4		4
	Demand Minus Supply*	-1		+8		+6	

* + indicates excess demand and - indicates excess supply.

TABLE C

CALIFORNIA

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
100-111	Total Additional Demand	153	163	163
	Total Additional Supply	111	137	116
100; 16.0115	Nuclear Technology	71	72	70
17.2004	Radioisotopes Use	26	26	26
102	Accelerator Operator	6	11	13
104	Nuclear Power Plant Operator	5	25	5
107	Nuclear Facility Equipment Operator	3	3	2
	Demand Minus Supply*	+42	+ 26	+47
	Test and Measurement Technology			
200-205	Total Additional Demand	353	381	379
	Total Additional Supply	413	433	395
201; 07.0902	Radiation Control	5	12	9
202; 16.0105	Radiochemistry	8	6	5
203; 17.2002	Non-Destructive Testing	377	397	364
204; 17.2003	Radiography	23	18	17
	Demand Minus Supply*	-60	- 52	-16
	Instrumentation Technology			
301-303	Total Additional Demand	49	52	70
	Total Additional Supply	16	22	26
301	Instrumentation and Control	2	7	12
16.0108	Electronic Technician (Nuclear)	2	2	2
302	Well-Logging	12	13	14
	Demand Minus Supply*	+33	+ 30	+44
	Nuclear Medical and Health Related Technology			
400-412	Total Additional Demand	681	802	769
	Total Additional Supply	745	1001	1088
401; 07.0501	Radiology	553	739	801
16.0304	Radiology X-Ray	43	63	75
403; 07.0503	Nuclear Medicine	107	143	152
408; 07.0502	Radiation Therapy	36	47	51
409	Internal Dosimetry	0	1	0
410	Radiobiology	0	1	2
411	Radiopharmacist	6		7
	Demand Minus Supply*	-64	-199	-319

* + indicates excess demand and - indicates excess supply.

TABLE C

COLORADO

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
100-103	Total Additional Demand	66	64	55
	Total Additional Supply	1	2	3
17.2004, 105	Radioisotope Use	1	2	2
	Nuclear Material Processor, Senior	0	0	1
	Demand Minus Supply*	+ 65	+ 62	+ 52
	Test and Measurement Technology			
200-205	Total Additional Demand	48	52	47
	Total Additional Supply	18	16	15
07.0902, 201	Radiation Control	11	12	11
202	Radiochemistry	2	1	2
204	Radiography	3	0	0
205	Nuclear Geology	2	3	2
	Demand Minus Supply*	+ 30	+ 36	+ 32
	Instrumentation Technology			
301-303	Total Additional Demand	14	15	15
	Total Additional Supply	58	58	60
16.0108	Electronic Technology (Nuclear)	25	25	25
16.0109	Electromechanical Technology (Nuclear)	20	20	20
16.0112	Instrumentation (Nuclear)	10	10	10
302	Well-Logging	3	3	5
	Demand Minus Supply*	- 44	- 43	- 45
	Nuclear Medical and Health Related Technology			
401-412	Total Additional Demand	122	183	193
	Total Additional Supply	224	250	239
07.0501	Radiology	163	180	177
07.0503, 403	Nuclear Medicine	48	54	46
07.0502	Radiation Therapy	12	15	15
409	Internal Dosimetry	1	1	1
	Demand Minus Supply*	-102	- 67	- 46

* + indicates excess demand and - indicates excess supply.

TABLE C

IDAHO

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
101-109	Total Additional Demand	48	38	35
	Total Additional Supply	9	13	12
101	Reactor Operator	7	5	5
105	Nuclear Material Processor, Senior	2	4	4
106	Hot-Cell Technician	0	4	3
	Demand Minus Supply*	+ 39	+ 25	+ 23
	Test and Measurement Technology			
201-204	Total Additional Demand	28	26	23
	Total Additional Supply	22	10	9
07.0902, 201	Radiation Control	21	7	7
203	NDT Technology	0	1	0
204	Radiography	1	2	2
	Demand Minus Supply*	+ 6	+ 16	+ 14
	Instrumentation Technology			
301-303	Total Additional Demand	10	8	6
	Total Additional Supply	0	0	0
	Demand Minus Supply*	+ 10	+ 8	+ 6
	Nuclear Medical and Health Related Technology			
401-410	Total Additional Demand	20	21	14
	Total Additional Supply	16	10	10
07.0501	Radiology	16	8	8
408	Radiation Therapy	0	2	2
	Demand Minus Supply*	+ 4	+ 11	+ 4

* + indicates excess demand and - indicates excess supply.

TABLE C

MONTANA

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Test and Measurement Technology			
201-202	Total Additional Demand	1	0	0
	Total Additional Supply	0	0	0
	Demand Minus Supply*	+ 1	0	0
	Nuclear Medical and Health Related Technology			
401-412	Total Additional Demand	23	27	30
	Total Additional Supply	28	27	31
07.0501	Radiology	26	21	23
07.0503	Nuclear Medicine	2	33	7
410	Radiobiology	0	3	1
	Demand Minus Supply*	- 5	0	- 1

* + indicates excess demand and - indicates excess supply.

TABLE C

NEVADA

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
100	Total Additional Demand	0	0	0
	Total Additional Supply	1	0	0
16.0115	Nuclear Technology	1	0	0
	Demand Minus Supply*	- 1	0	0
	Test and Measurement Technology			
201-204	Total Additional Demand	14	19	38
	Total Additional Supply	20	40	40
201	Radiation Control	20	40	40
	Demand Minus Supply*	- 6	- 21	- 2
	Nuclear Medical and Health Related Technology			
401-410	Total Additional Demand	24	28	33
	Total Additional Supply	47	46	59
07.0501, 401	Radiology	42	41	52
16.0304	Radiology (X-Ray)	1	1	2
07.0503	Nuclear Medicine	3	2	1
07.0502	Radiation Therapy	0	0	2
407	Special Procedures	1	2	2
	Demand Minus Supply*	- 23	- 18	- 26

* + indicates excess demand and - indicates excess supply.

TABLE C

NEW MEXICO

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
101-109	Total Additional Demand	24	18	25
	Total Additional Supply	0	0	0
	Demand Minus Supply*	+ 24	+ 18	+ 25
	Test and Measurement Technology			
201-205	Total Additional Demand	63	59	72
	Total Additional Supply	13	0	0
201	Radiation Control	10	0	0
205	Nuclear Geology	3	0	0
	Demand Minus Supply*	+ 50	+ 59	+ 72
	Instrumentation Technology			
301-303	Total Additional Demand	14	12	11
	Total Additional Supply	1	1	1
302	Well-Logging	1	1	1
	Demand Minus Supply*	+ 13	+ 11	+ 10
	Nuclear Medical and Health Related Technology			
401-412	Total Additional Demand	77	83	95
	Total Additional Supply	[illegible]	54	71
07.0501, 401	Radiology	14	34	46
07.0503	Nuclear Medicine	5	5	5
412	Inhalation Toxicology	0	15	20
	Demand Minus Supply*	+ 58	+ 29	+ 24

* + indicates excess demand and - indicates excess supply.

TABLE C

OREGON

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
101-108	Total Additional Demand	14	14	14
	Total Additional Supply	30	30	30
16.0115	Nuclear Technology	26	24	26
17.2001	Installation, Operation and Maintenance of Reactors	4	0	0
	Demand Minus Supply*	- 16	- 10	- 13
	Test and Measurement Technology			
201-204	Total Additional Demand	35	30	26
	Total Additional Supply	72	55	58
07.0902	Radiation Control	32	32	32
16.0105	Nuclear Chemistry Technology	0	12	12
203	NDT Technology	6	6	6
204	Radiography	34	5	4
	Demand Minus Supply*	- 37	- 25	- 28
	Instrumentation Technology			
301-303	Total Additional Demand	3	4	3
	Total Additional Supply	24	30	32
16.0108	Electronic Technology (Nuclear)	12	18	20
16.0112	Instrumentation Technology (Nuclear)	12	12	12
	Demand Minus Supply*	- 21	- 26	- 29
	Nuclear Medical and Health Related Technology			
401-411	Total Additional Demand	50	60	79
	Total Additional Supply	38	37	37
07.0501	Radiology	33	33	33
07.0503, 403	Nuclear Medicine	5	4	4
	Demand Minus Supply*	+ 12	+ 23	+ 42

* + indicates excess demand and - indicates excess supply.

TABLE C

UTAH

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975		1976		1977	
	Reactor Operation and Nuclear Production Technology						
102	Total Additional Demand	0		0		1	
108	Total Additional Supply	45		55		65	
	Nuclear Facility Maintenance		45		55		65
	Demand Minus Supply*	- 45		- 55		- 64	
	Test and Measurement Technology						
210-205	Total Additional Demand	9		2		5	
17.2002, 203	Total Additional Supply	1		2		2	
	NDT Technology		1		2		2
	Demand Minus Supply*	+ 8		0		+ 3	
	Instrumentation Technology						
301-302	Total Additional Demand	3		7		8	
16.0108	Total Additional Supply	25		30		40	
	Electronic Technology (Nuclear)		25		30		40
	Demand Minus Supply*	- 22		- 23		- 32	
	Nuclear Medical and Health Related Technology						
400-410	Total Additional Demand	40		40		48	
	Total Additional Supply	47		44		47	
07.0501	Radiology		24		27		28
15.0304	Radiology (X-Ray)		1		1		1
07.0503, 403	Nuclear Medicine		16		10		12
07.0502	Radiation Therapy		6		6		6
	Demand Minus Supply*	- 7		- 4		+ 1	

*+ indicates excess demand and - indicates excess supply.

TABLE C

WASHINGTON

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES / TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
101-111	Total Additional Demand	118	144	121
	Total Additional Supply	8	55	22
101	Reactor Operator	2	5	5
104	Nuclear Power Plant Operator	0	47	14
16.0115	Nuclear Technology	5	2	2
17.2004	Radioisotope Use	1	1	1
	Demand Minus Supply*	+110	+ 89	+ 99
	Test and Measurement Technology			
201-205	Total Additional Demand	160	148	152
	Total Additional Supply	64	73	61
07.0902, 201	Radiation Control	6	8	11
16.0105, 202	Nuclear Chemistry Technology	4	5	7
17.2002, 203	NDT Technology	23	27	23
17.2003, 204	Radiography	31	33	20
	Demand Minus Supply*	+ 96	+ 75	+ 91
	Instrumentation Technology			
301-303	Total Additional Demand	16	29	24
	Total Additional Supply	2	5	11
301	Instrumentation Control	1	4	10
16.0108	Electronic Technology (Nuclear)	1	1	1
	Demand Minus Supply*	+ 14	+ 24	+ 13
	Nuclear Medical and Health Related Technology			
401-412	Total Additional Demand	87	103	100
	Total Additional Supply	69	78	78
07.0501, 401	Radiology	58	64	58
07.0503	Nuclear Medicine	10	12	16
409	Internal Dosimetry	1	2	4
	Demand Minus Supply*	+ 18	+ 25	+ 22

* + indicates excess demand and - indicates excess supply.

TABLE C

WYOMING

PROJECTED ADDITIONAL DEMAND AND PROJECTED ADDITIONAL SUPPLY
BY JOB CLUSTER

JOB CODES AND TRAINING AREA CODES	TECHNICIAN JOB CLUSTER AND TRAINING AREA	PROJECTED ADDITIONAL MANPOWER 1975	1976	1977
	Reactor Operation and Nuclear Production Technology			
105	Total Additional Demand	7	5	5
	Total Additional Supply	0	0	0
	Demand Minus Supply*	+ 7	+ 5	+ 5
	Test and Measurement Technology			
201-205	Total Additional Demand	9	14	19
	Total Additional Supply	4	6	12
201	Radiation Control	1	0	0
202	Nuclear Chemistry Technology	0	0	5
203	NDT Technology	3	5	5
205	Nuclear Geology Technology	0	1	2
	Demand Minus Supply*	+ 5	+ 8	+ 7
	Instrumentation Technology			
301-303	Total Additional Demand	15	10	9
	Total Additional Supply	5	2	3
302	Well-Logging	5	2	3
	Demand Minus Supply*	+10	+ 8	+ 6
	Nuclear Medical and Health Related Technology			
401-410	Total Additional Demand	6	3	8
	Total Additional Supply	8	17	16
07.0501	Radiology	8	17	16
	Demand Minus Supply*	- 2	-14	- 8

* + indicates excess demand and - indicates excess supply.

APPENDIX D

List of Training Institutions Reported in the WINB Region by Training Area.

This list contains formal education organization and medical facility based training programs in the following areas.

Radiologic Technology
Radiologic Technology (x-ray)
Radiation Therapy
Nuclear Medical Technology
Special Procedures Technology
Radiopharmacy Technology
Radiobiology Technology
Inhalation Toxicology Technicians
Radiological Health (Health Physics) Technicians
Nuclear Technology
Installation, Operation and Maintenance of Reactors
Reactor Operation
Nuclear Facility Maintenance Technology
Electronic Technology (Nuclear Option)
Electromechanical Technology (Nuclear Option)
Instrumentation Technology (Nuclear Option)
Chemical Technology (Nuclear Option)
Drafting (Nuclear Option)
Welding Technology (Nuclear Option)
Electronic and Instrument Technology (Nuclear Option)
Metallurgical Technology (Nuclear Option)

BILNG DEACONESS HOSP
2813 9TH AVE N
BILLINGS MT 59101

ST VINCENTS HOSPITAL
PO BOX 2505
BILLINGS MT 59103

COLUMBUS HOSPITAL
1601 2ND AVE N
GREAT FALLS MT 59401

MONT DEACONESS HOSP
1101 26TH ST SO
GREAT FALLS MT 59405

ST PATRICK HOSP
500 W BROOKWAY
MISSOULA MT 59801

DEPT RAD ST LUKES
601 E 19TH AVE
DENVER CO 80203

BETH ISRAEL HOSPITAL
1601 LOWELL BV
DENVER CO 80204

ST ANTHONY HOSP SYS
4231 W 16TH AVE
DENVER CO 80204

RAD THERAPY + NUC
1719 E 19TH AVE
DENVER CO 80218

U OF COL MED CTR
4200 EAST NINTH AVE
DENVER CO 80220

BOULDER COMM HOSP
1100 BALSAM
BOULDER CO 80303

LONGMONT UNITED HOSP
1950 W MOUNTAIN VIEW
LONGMONT CO 80501

DOCTORS MED CTR XRAY
1217 ELIZABETH
FT COLLINS CO 80521

WELD CNTY GEN RAD
16 ST AT 17 AVE
GREELEY CO 80631

DEPT OF RADIOLOGY
USAF ACADEMY HOSP
USAF ACADEMY CO 80840

ST FRANCIS HOSPITAL
E PIKES PEAK AVE
COLO SPGS CO 80903

MEMORIAL HOSP
1400 E BLOR ST
COLO SPRGS CO 80909

ST MARY CORWIN HOSP
1108 MINNEQUA
PUEBLO CO 81004

ST MARYS HOSP
PO BOX 1648
GRAND JUNCTION CO 81501

LARAMIE CO MEM HOSP
CHEYENNE WY 82001

VETERAN ADMIN CENTER
2360 E PERSHING BLVD
CHEYENNE WY 82001

BANNOCK MEM HOSP
MEMORIAL DR
POCATELLO ID 83201

ST ALPHONSUS HOSPITL
1055 N CURTIS RD
BOISE ID 83702

ST LUKE S HOSPITAL
130 E BANNOCK
BOISE ID 83702

MED CL INC RADIOG DP
212 SO 11TH ST
COEUR D ALENE ID 83814

UN OF UT UN MED CTR
50 N MEDICAL DR
SALT LAKE CY UT 84112

US VA HOSP
500 FOOT HILL DR
SLC UT 84113

LATTER DAY SAINTS HO
325 8TH AVE
SALT LAKE CITY UT 84143

ST BENEDICTS HOSP
3000 POLK AVE
OGDEN UT 84403

MARICOPA TECH COLL
106 E WASH ST
PHOENIX AZ 85004

ST LUKES HOSP MED CR
525 NORTH 18TH ST
PHOENIX AZ 85006

GOOD SAMARITAN HOSP
1033 E MCDOWELL
PHOENIX AZ 85006

MARICOPA CO GEN HOSP
2601 E ROOSEVELT ST
PHOENIX AZ 85008

ST JOS HOSP + MED CT
350 W THOMAS RD
PHOENIX AZ 85013

PHOENIX GENERAL HOSP
1950 W INDIAN SCH RD
PHOENIX AZ 85015

JOHN C LINCOLN HOSP
9211 NORTH SECOND ST
PHOENIX AZ 85020

MARYVALE SAMRTN HOSP
5102 W CAMPBELL
PHOENIX AZ 85031

ASSOCIATED RAD LTD
450 W 5TH PLACE
MESA AZ 85201

MESA LUTHERAN HOSP
501 W 10TH PLACE
MESA AZ 85201

PIMA COMMUNITY COLL
2202 W ANKLAM RD
TUCSON AZ 85709

UNIV ARIZ COLL MED
1501 N CAMPBELL AVE
TUCSON AZ 85724

NORTHERN ARIZ UNIV
BOX 15075
FLAGSTAFF AZ 86001

FLAGSTAFF HOSPITAL
1215 N BEAVER
FLAGSTAFF AZ 86001

PRESBYTERIAN HOSP CT
1120 CENTRAL AVE S E
ALBUQUERQUE NM 87106

UNIV OF ALBUQUERQUE
ST JOSEPH PLACE NW
ALBUQUERQUE NM 87140

MEMORIAL GEN HOSP
TELSHOR + UNIV
LAS CRUCES NM 88001

N LAS VEGAS HOSP
1401 E LAKE MD
NO LAS VEGAS NV 89030

UNV OF NEVADA L VEGS
LAS VEGAS NV 89109

VA HOSPITAL RAD SERV
1000 LOCUST STREET
RENO NV 89502

WESTERN NEV COMM COL
4815 ECHO AVE
RENO NV 89506

CAL HOSP MED CENTER
1414 S HOPE ST
LOS ANGELES CA 90015

QUEEN OF ANGELS HOSP
2301 BELLUVE
LOS ANGELES CA 90026

CHILDRENS HOSPITAL
4650 SUNSET BLVD
LOS ANGELES CA 90027

KAISER FOUND HOSP
4867 SUNSET BLVD
LOS ANGELES CA 90027

HOLLYWOOD PRESBY HOS
1300 N VERMONT
LOS ANGELES CA 90027

L A CITY COLLEGE
855 N VERMONT
LOS ANGELES CA 90029

CEDARS OF LEBANON HO
4833 FOUNTAIN
LOS ANGELES CA 90029

LAC USC MEDICAL CTR
1200 NO STATE ST
LOS ANGELES CA 90033

SOUTHLAND COLLEGE
6363 WILSHIRE BLVD
LOS ANGELES CA 90048

ST VINCENTS MED CTR
2131 W THIRD ST
LOS ANGELES CA 90057

NUC MED KING HOSP
12021 WILMINGTON AVE
LOS ANGELES CA 90059

DR D M BROTMAN MEM H
03828 HUGHES AVE
CULVER CITY CA 90230

DOWNEY COMMUNITY HSP
11500 BROOKSHIR
DOWNEY CA 90241

DEPT OF RADIOLOGY
333 N PRAIRIE AVE
INGLEWOOD CA 90301

LITTLE CO MARY HOSP
4101 TORRANCE
TORRANCE CA 90503

LA CNTY HAR GEN HOSP
1000 WEST CARSON
TORRANCE CA 90509

LA MIRADA COMM HOSP
14900 E IMPERIAL BLV
LA MIRADA CA 90638

VETERANS ADMIN HOSP
5901 E 7TH ST
LONG BEACH CA 90801

PACIFIC HOSP OF L B
2776 PACIFIC AVE
LONG BEACH CA 90806

LONG BEACH CITY COLL
4901 EAST CARSON ST
LONG BEACH CA 90808

CITY OF HOPE MED CTR
1500 E DUARTE
DUARTE CA 91010

HUNTINGTON MEM HOSP
100 CONGRESS ST
PASADENA CA 91105

PASADENA CITY COLL
1570 E COLO VD
PASADENA CA 91106

WEST HILLS HOSPITAL
23023 SHERMAN PL
CANOGA PARK CA 91307

VETERANS ADMIN HOSP
16111 PLUMMER
SEPULVEDA CA 91343

NORTHRIDGE HOSP
18300 ROSCOE BLVD
NORTHRIDGE CA 91356

ST JOSEPH MED CENTER
BUENA VISTA + ALAMED
BURBANK CA 91505

INTR-CMN HOSP INC
275 W COLLEGE STREET
COVINA CA 91723

POMONA VLY COMM HOSP
1798 N GAREY
POMONA CA 91767

CA ST POLYTECHNIC UN
3801 W TEMPLE AVE
POMINA CA CA 91768

ST JOSEPH HOSPITAL
1100 W STEWART
ORANGE CA 91768

GROSSMONT DIST HOSP
PO BOX 148
LA MESA CA 92041

UNIV OF CA MED CNTR
225 W DICKINSON ST
SAN DIEGO CA 92103

MERCY HOSPITAL
4077 FIFTH AVE
SAN DIEGO CA 92103

DOCTORS HOSP S/D
3475 KENYON ST
SAN DIEGO CA 92110

RADIATION SAFETY
LOMA LINDA UNIV
LOMA LINDA CA 92354

SAN BERN CO GEN HOSP
780 E GILBERT ST
SAN BERNARDINO CA 92404

ORANGE COAST COLL
2701 FAIRVIEW RD
COSTA MESA CA 92626

COAST COMM COLL DIST
1370 ADAMS AVE
COSTA MESA CA 92626

SAINT JUDE HOSPITAL
101 E VALENCIA
FULLERTON CA 92632

UNIV CALIF IRVINE
EH+S OFFICE
IRVINE CA 92664

ORANGE CNTY MED CTR
101 CITY DRIVE SOUTH
ORANGE CA 92668

ST JOSEPH HOSPITAL
1100 STEWART DR
ORANGE CA 92668

MISSION COM HOSP
27802 PUERTA PL
MISSION VIEJO CA 92675

SOUTH CST COMM HOSP
31872 SO COAST HGWY
SO LAGUNA CA 92677

TUSTIN COMM HOSPITAL
14662 NEWPORT AVE
TUSTIN CA 92680

SANTA BARBARA CTY CO
721 CLIFF DRIVE
SANTA BARBARA CA 93109

KERN CO GEN HOSP
1830 FLOWER ST
BAKERSFIELD CA 93305

ANTELOPE VALLEY HOSP
1600 W AVE J
LANCASTER CA 93534

FRESNO CITY COLLEGE
1101 EAST UNIV AVE
FRESNO CA 93741

MARYS HELP HOSPITAL
1900 SULLIVAN
DALY CITY CA 94014

FOOTHILL JR COLL DIS
12345 S E MONTE AVE
LOS ALTOS HILL CA 94022

COSA MESA MEM HOSP
301 VICTORIA AVE
COSTA MESA CA 94040

CANADA COLLEGE
4200 FARM HILL BLVD
REDWOOD CITY CA 94061

SEQUOIA HOSPITAL DIS
WHIPPLE + ALAMADA
REDWOOD CITY CA 94063

ST LUKES HOSPITAL
3555 ARMY
SAN FRANCISCO CA 94110

CITY COL OF SAN FRAN
50 PHELAN AVENUE
SAN FRANCISCO CA 94112

ST JOSEPHS HOSPITAL
355 BUENA VISTA
SAN FRANCISCO CA 94117

UNIV OF CALIFORNIA
SAN FRANCISCO
SAN FRANCISCO CA 94143

STANFORD UNIVERSITY
67 ENCINA
STANFORD CA 94305

CHOPE COMM HOSPITAL
222 W 39TH ST
SAN MATEO CA 94403

C C CNTY MED SERVICE
2500 ALHAMBRA AV
MARTINEZ CA 94553

LOS MEDANOS COMM HOS
550 SCHOOL ST
PITTSBURG CA 94565

DOCTRS HOSP SAN LEAN
13855 E 14TH ST
SAN LEANDRO CA 94578

R F CHAMBERS MD
300 HOSPITAL DR
VALLEJO CA 94590

HIGHLAND GEN L HOSP
1411 E 31ST ST
OAKLAND CA 94602

MERRITT COLLEGE
12500 CAMPUS DR
OAKLAND CA 94619

ALTA BATES COMM HOSP
WEBSTER AT REG
BERKELEY CA 94705

O CONNOR HOSPITAL
2105 FOREST AVE
SAN JOSE CA 95114

MERCED COLLEGE
3600 M ST
MERCED CA 95340

MERCED COMM MED CTR
290 E 15TH ST
MERCED CA 95340

YUBA COLLEGE
2088 N BEALE RD
MARYSVILLE CA 95901

UNIV OF ORE HLTH CT
3181 SM JCKSN
PORTLAND OR 97201

PHYS + SURG HOSPITAL
1927 NW LOVEJOY
PORTLAND OR 97209

PORTLAND ADV HOSP
6040 SE BELMONT
PORTLAND OR 97215

ALBANY GENERAL HOSP
1046 W 6TH
ALBANY OR 97321

MERCY HOSPITAL
621 W MADRONE
ROSEBURG OR 97470

PROVIDENCE HOSPITAL
17 AVE + E JEFFERSON
SEATTLE WA 98122

ST JOSEPH HOSPITAL
18TH AND SOUTH I
TACOMA WA 98401

GROSS LARSON WHITNEY
522 MED ARTS BLDG
TACOMA WA 98402

TACOMA GEN HOSPITAL
315 SOUTH K STREET
TACOMA WA 98405

WENATCHEE VALLEY CLN
820 N CHELAN AVE
WENATCHEE WA 98801

YAKIMA VAL GEN HOSP
2811 TIETON DRIVE
YAKIMA WA 98902

HOLY FAMILY HOSPITAL
N 5633 LIDGERWOOD
SPOKANE WA 99207

RADIOLOGIC TECHNOLOGY (X-RAY)

CA ST POLYTECHNIC UN
3801 W TEMPLE AVE
POMINA CA CA 91768

ST FRANCIS HOSP
3630 IMPERIAL HWY
LYNWOOD CA 90262

ESKATON AMER RVR HLT
4747 ENGLE RD
CARMICHAEL CA 95608

LA MIRADA COMM HOSP
14900 E IMPERIAL BLV
LA MIRADA CA 90638

ONCOLOGICAL SERV INC
95 MONTGOMERY DR#118
SANTA ROSA CA 95401

US VA HOSP
500 FOOT HILL DR
SLC UT 84113

UNV OF NEVADA L VEGS
LAS VEGAS NV 89109

RADIATION THERAPY

DEPT RAD ST LUKES
601 E 19TH AVE
DENVER CO 80203

U OF COL MED CTR
4200 EAST NINTH AVE
DENVER CO 80220

UN OF UT UN MED CTR
50 N MEDICAL DR
SALT LAKE CY UT 84112

LATTER DAY SAINTS HO
325 8TH AVE
SALT LAKE CITY UT 84143

RADIATION CENTER
325 8TH AVENUE
SALT LAKE CITY UT 84143

GOOD SAMARITAN HOSP
1033 E MCDOWELL
PHOENIX AZ 85006

UNV OF NEVADA L VEGS
LAS VEGAS NV 89109

CAL HOSP MED CENTER
1414 S HOPE ST
LOS ANGELES CA 90015

LAC USC MEDICAL CTR
1200 NO STATE ST
LOS ANGELES CA 90033

CITY OF HOPE MED CTR
1500 E DUARTE
DUARTE CA 91010

ST JOSEPH MED CENTER
BUENA VISTA + ALAMED
BURBANK CA 91505

UNIV OF CA MED CNTR
225 W DICKINSON ST
SAN DIEGO CA 92103

RADIATION SAFETY
LOMA LINDA UNIV
LOMA LINDA CA 92354

CANCER FOUNDATION
P O BOX 837
SANTA BARBARA CA 93102

CITY COL OF SAN FRAN
50 PHELAN AVENUE
SAN FRANCISCO CA 94112

STANFORD UNIV HOSP
300 PASTEUR DRIVE
PALO ALTO CA 94304

MEM HOSP STANISLS CO
PO BOX 942
MODESTO CA 95353

NUCLEAR MEDICAL TECHNOLOGY

ST VINCENTS HOSPITAL
PO BOX 2505
BILLINGS MT 59103

MONT DEACONESS HOSP
1101 26TH ST SO
GREAT FALLS MT 59405

CARROLL COLLEGE
CARROLL COLLEGE
HELENA MT 59601

GEN ROSE MEM HOSP
1050 CLERMONT ST
DENVER CO 80202

DEPT RAD ST LUKES
601 E 19TH AVE
DENVER CO 80203

ST ANTHONY HOSP SYS
4231 W 16TH AVE
DENVER CO 80204

DEPT RAD MERCY HOSP
16 + MILWAUKEE
DENVER CO 80206

ST JOSEPH HOSP LAB
1835 FRANKLIN ST
DENVER CO 80218

U OF COL MED CTR
4200 EAST NINTH AVE
DENVER CO 80220

VA HOSPITAL
1055 CLERMONT ST
DENVER CO 80220

PENROSE HOSPITAL
2215 N CASCADE AVE
COLO SPRINGS CO 80907

UN OF UT UN MED CTR
50 N MEDICAL DR
SALT LAKE CY UT 84112

LATTER DAY SAINTS HO
325 8TH AVE
SALT LAKE CITY UT 84143

GOOD SAMARITAN HOSP
1033 E MCDOWELL
PHOENIX AZ 85006

ST JOS HOSP + MED CT
350 W THOMAS RD
PHOENIX AZ 85013

UNIV ARIZ COLL MED
1501 N CAMPBELL AVE
TUCSON AZ 85724

UNIV NM SCH MED NUC
2211 LOMAS BLVD
ALBUQUERQUE NM 87106

SO NEVADA MEM HOSP
1800 W CHRLESTN
LAS VEGAS NV 89106

UNV OF NEVADA L VEGS
LAS VEGAS NV 89109

L A CITY COLLEGE
855 N VERMONT
LOS ANGELES CA 90029

LAC USC MEDICAL CTR
1200 NO STATE ST
LOS ANGELES CA 90033

NUC MED KING HOSP
12021 WILMINGTON AVE
LOS ANGELES CA 90059

CENTURY CITY HOSP
2070 CENTURY PARK
LOS ANGELES CA 90067

VA WADSWORTH HOS CTR
WILSHIRE + SAWTELLE
LOS ANGELES CA 90073

COMPTON COLLEGE
1111 E ARTESIA
COMPTON CA 90221

DR D M BROTMAN MEM H
03828 HUGHES AVE
CULVER CITY CA 90230

MEM HOSP OF GARDENA
1145 W REDONDO
GARDENA CA 90247

DANIEL FREEMAN HOSP
333 N PRAIRIE
INGELWOOD CA 90303

LA CNTY HAR GEN HOSP
1000 WEST CARSON
TORRANCE CA 90509

DOM HILLS ST COLLEGE
809 E VICTORIA
DOMINGUEZ HILLS CA 90747

VETERANS ADMIN HOSP
5901 E 7TH ST
LONG BEACH CA 90801

CITY OF HOPE MED CTR
1500 E DUARTE
DUARTE CA 91010

HUNTINGTON MEM HOSP
100 CONGRESS ST
PASADENA CA 91105

WEST HILLS HOSPITAL
23023 SHERMAN PL
CANOGA PARK CA 91307

VLY PRESBYTERIAN HOS
7107 VANOWEN ST
VAN NUYS CA 91405

OLIVE VIEW MED CENTR
7533 VAN NUYS BLVD
VAN NUYS CA 91405

CA ST POLYTECHNIC UN
3801 W TEMPLE AVE
POMONA CA CA 91768

ST JOSEPH HOSPITAL
1100 W STEWART
ORANGE CA 91768

GROSSMONT DIST HOSP
PO BOX 148
LA MESA CA 92041

TRI-CITY HOSP
4002 VISTA WAY
OCEANSIDE CA 92054

UNIV OF CA MED CNTR
225 W DICKINSON ST
SAN DIEGO CA 92103

RADIATION SAFETY
LOMA LINDA UNIV
LOMA LINDA CA 92354

SAINT JUDE HOSPITAL
101 E VALENCIA
FULLERTON CA 92632

ORANGE CNTY MED CTR
101 CITY DRIVE SOUTH
ORANGE CA 92668

ST JOSEPH HOSPITAL
1100 STEWART DR
ORANGE CA 92668

SOUTH CST COMM HOSP
31872 SO COAST HGWY
SO LAGUNA CA 92677

CANCER FOUNDATION
P O BOX 837
SANTA BARBARA CA 93102

KERN CO GEN HOSP
1830 FLOWER ST
BAKERSFIELD CA 93305

PALMDALE GEN HOSP
P O BOX 730
PALMDALE CA 93550

ST AGNES HOSPITAL
530 W FLORADORA AVE
FRESNO CA 93728

STANFORD UNIVERSITY
67 ENCINA
STANFORD CA 94305

DOCTRS HOSP SAN LEAN
13855 E 14TH ST
SAN LEANDRO CA 94578

ALTA BATES COMM HOSP
WEBSTER AT REG
BERKELEY CA 94705

MEM HOSP STANISLS CO
PO BOX 942
MODESTO CA 95353

ESKATON AMER RVR HLT
4747 ENGLE RD
CARMICHAEL CA 95608

SACRAMENTO MED CENTR
2315 STOCKTON
SACRAMENTO CA 95817

UNIV OF ORE HLTH CT
3181 SW JCKSN
PORTLAND OR 97201

SACRED HEART GEN HOS
1200 ALDER ST
EUGENE OR 97401

SEATTLE UNIVERSITY
12TH AND E COLUMBIA
SEATTLE WA 98122

MAMC NUCLEAR MED
BOX 250
TACOMA WA 98404

MADIGAN ARMY MED CTR
BOX 250
TACOMA WA 98431

HOLY FAMILY HOSPITAL
N 5633 LIDGERWOOD
SPOKANE WA 99207

SPECIAL PROCEDURES TECHNOLOGY

UNV OF NEVADA L VEGS
LAS VEGAS NV 89109

RADIOPHARMACY TECHNOLOGY

UNIV OF SO CALIF
1985 ZONAL AVE
LOS ANGELES CA 90033

RADIOBIOLOGY TECHNOLOGY

CARROLL COLLEGE
CARROLL COLLEGE
HELENA MT 59601

INHALATION TOXICOLOGY TECHNICIANS

INHALATION TOX RES
P O BOX 5890
ALBUQUERQUE NM 87115

RADIOLOGICAL HEALTH (HEALTH PHYSICS) TECHNICIANS

UNIV OF COLORADO
HEALTH PHYSICS LAB
BOULDER CO 80302

ISU DEPT OF ENG
BOX 8060
POCATELLO ID 83209

REYNOLDS ELEC & ENGR
P O BOX 14400
LAS VEGAS NV 89114

CAL ST L A

L A CA 90032

LEWIS & CLARK COLL
0615 SW PALATNE
PORTLAND OR 97219

ORANGE CNTY MED CTR
101 CITY DRIVE SOUTH
ORANGE CA 92668

WESTERN WASH ST COLL
PHYSICS DEPT
BELLINGHAM WA 98225

NUCLEAR TECHNOLOGY

COLLEGE OF ENGINEER

RENO NV 89702

CAL STATE UNIV

NORTHRIDGE CA 91324

POMONA VLY COMM HOSP
1798 N GAREY
POMONA CA 91767

SONOMA STATE COLL
1801 E COTATI
ROHNERT PARK CA 94928

UNIV OF SANTA CLARA
820 ALVISO STREET
SANTA CLARA CA 95053

REED COLLEGE
REACTOR FACILITY
PORTLAND OR 97202

OREGON STATE UNIV
35TH + JEFFERSON
CORVALLIS OR 97331

OREGON INST OF TECH
CAMPUS DRIVE
KLAWATH FALLS OR 97601

WESTERN WASH ST COLL
PHYSICS DEPT
BELLINGHAM WA 98225

CENTR WASH ST COLL

ELLENSBURG WA 98926

GONZAGA UNIVERSITY
502 E BOONE
SPOKANE WA 99202

OPERATION AND MAINTENANCE OF REACTORS

REED COLLEGE
REACTOR FACILITY
PORTLAND OR 97202

REACTOR OPERATION

UNIV CALIF IRVINE
EH+S OFFICE
IRVINE CA 92664

NUCLEAR FACILITY MAINTENANCE TECHNOLOGY

UTAH TECH COLLEGE
1395 N 150 EAST
PROVO UT 84601

ELECTRONIC TECHNOLOGY (NUCLEAR OPTION)

E GRIFFITH OPPOR SCH
1250 WELTON ST
DENVER CO 80204

UTAH TECH COLLEGE
1395 N 150 EAST
PROVO UT 84601

CAL STATE UNIV

NORTHRIDGE CA 91324

LINN-BENTON COMM COL
6500 SW PACIFIC BLVD
ALBANY OR 97321

WESTERN WASH ST COLL
PHYSICS DEPT
BELLINGHAM WA 98225

ELECTROMECHANICAL TECHNOLOGY (NUCLEAR OPTION)

E GRIFFITH OPPOR SCH
1250 WELTON ST
DENVER CO 80204

INSTRUMENTATION TECHNOLOGY (NUCLEAR OPTION)

E GRIFFITH OPPOR SCH
1250 WELTON ST
DENVER CO 80204

LINN-BENTON COMM COL
6500 SW PACIFIC BLVD
ALBANY OR 97321

OREGON INST OF TECH
CAMPUS DRIVE
KLAWATH FALLS OR 97601

CHEMICAL TECHNOLOGY (NUCLEAR TECHNOLOGY)

MERRITT COLLEGE
12500 CAMPUS DR
OAKLAND CA 94619

LINN-BENTON COMM COL
6500 SW PACIFIC BLVD
ALBANY OR 97321

WESTERN WASH ST COLL
PHYSICS DEPT
BELLINGHAM WA 98225

DRAFTING (NUCLEAR OPTION)

E GRIFFITH OPPOR SCH
1250 WELTON ST
DENVER CO 80204

WELDING TECHNOLOGY (NUCLEAR OPTION)

UTAH TECH COLLEGE
1395 N 150 EAST
PROVO UT 84601

SERVICE SCHOOL COMM
NAVAL STATION BOX 6
SAN DIEGO CA 92136

OREGON INST OF TECH
CAMPUS DRIVE
KLAWATH FALLS OR 97601

E GRIFFITH OPPOR SCH
1250 WELTON ST
DENVER CO 80204

ELECTRONIC AND INSTRUMENT TECHNOLOGY (NUCLEAR OPTION)

E GRIFFITH OPPOR SCH
1250 WELTON ST
DENVER CO 80204

METALLURGICAL TECHNOLOGY (NUCLEAR OPTION)

SO COLO STATE COLL
2200 N BONFORTE BLVD
PUEBLO CO 81001